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JOURNAL
OF
FARM ECONOMICS

Volume XXXVIII FEBRUARY, 1956 Number 1

RESEARCH AND MARKETING ADVISORY COMMITTEES[1]

HARRY C. TRELOGAN
Marketing Research Division, Agricultural Marketing Service

ADVISORY committees have played a prominent role in shaping the program of research and related activities developed under the Research and Marketing Act of 1946. They have exerted a stronger and broader influence on agricultural research since they were formally authorized in that legislation. Although the use of advisory committees for guidance of public research did not originate with this particular program, the distinctly greater importance the committees have assumed over the past eight years can be regarded as a new force in agricultural research. Moreover, the evidence indicates this is a force that is here to stay. Therefore it behooves researchers as well as administrators of research to become more familiar with the reasons for the establishment of these committees, the nature of their activities, and the scope and purpose of their operations.

Why Advisory Committees?

The question of why such committees were provided for in agricultural research and marketing legislation is not fully answered in the following statement in the bill:

> In the furtherance of the research and service work authorized by this Act, the Secretary of Agriculture may, in addition to the National advisory committee, establish appropriate committees, including representatives of producers, industry, government, and science, to assist in effectuating specific research and service programs.

Probably a more enlightening answer is that we were outgrowing the previously established system of handling appropriations.

This reason was particularly pertinent as applied to research, but it was not confined to research. Significantly, at the time the Research and

[1] Paper presented before the Western Farm Economics Association, July 20, 1955 at Bozeman, Montana.

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Marketing Act was being formulated advisory boards, commissions or committees were being advocated by agricultural leaders in relation to several federal programs. The late Albert Goss, as the highly respected Master of the National Grange, was particularly outspoken and effective in recommending them for agricultural programs. He felt that busy legislative committees were unable to follow operations of large widespread activities sufficiently to exercise intelligent judgment on proposals for detailed adjustments in appropriations.

The problem was especially acute for research because much of the work and many of the research results were presented in technical language that was not quickly comprehended by the nonscientist. In fact a good share of the research tended to become so specialized that research administrators as well as legislators frequently felt the need for assistance from scientists in specialized fields to help them evaluate research proposals and findings. As a result communications between scientists, particularly those in public service, and the people, including their legislative representatives, tended to break down. A feeling arose that something was needed to bring agricultural research down to earth to deal effectively with current practical problems in agricultural production and marketing.

Complaints from research agencies that available funds were insufficient to allow for new work on important problems became so repetitious as to be regarded as trite. They were also interpreted as evidence of inflexibility of programs or laxity of administration. The tangible benefits from research, even as dramatic as those of hybrid corn and penicillin, somehow or other did not kindle the faith in agricultural science that would lead to greater support.

In fact, public criticism of agricultural research and researchers was mounting. Many people were impatient with some of the time-consuming and sometimes seemingly irrelevant work being done. Many criticized the researcher's technical language as a smokescreen used to obscure what was or was not being accomplished. In other instances, notably in the social sciences, outright antagonism appeared among legislators. In part, perhaps, this feeling arose from lack of understanding of some phases of research; but it also reflected doubt by the lawmakers that they shared the objectives of the scientists. Therefore appropriations for agricultural research tended not to expand, and in some cases were sharply curtailed.

Agricultural Research Stood Still

Except for the utilization research program in the regional research laboratories which began in 1938, agricultural research received no sub-

stantial increases in federal appropriations for about two decades before the enactment of the Research and Marketing Act in 1946. No widespread demand for expanded research appeared, other than that engendered by the farm chemurgic movement.

Agricultural research simply failed to keep pace with rapid expansion in other federal government programs. This was particularly apparent when agricultural research was compared with either federal agricultural activities generally or with all federal research activities. In 1932 research made up 24 percent of total U. S. Department of Agriculture appropriations for regular activities—in 1955 research made up 9 percent. In 1940, the earliest year for which we have comparable data, agricultural research comprised 40 percent of total federal research. In 1955 it is less than 4 percent.

Conditions for Expansion

The Research and Marketing Act authorized substantial expansion in agricultural research, education, and service. Agricultural leaders foresaw the need for changes in methods of administering research programs and of appropriating for the work on the much larger scale contemplated. Therefore, the Act included provisions in broad outline to permit the expected changes. However, during the first six years of the program authorizations for reorganized administration were not used to the extent visualized by the legislators. This was cited as a reason why the authorized appropriations were not realized.[2]

Authorization for advisory committees, on the other hand, was used to a high degree and met with favorable congressional reaction. Within a matter of months after the passage of the Act, 19 commodity and 3 functional advisory committees were established. Subsequently, this number was reduced somewhat, but has since been increased to 26 to provide more complete coverage of the total research program.

Although congressional approval of the general operations of the advisory committee system has been expressed repeatedly, congressional committees have not relinquished their own prerogatives for examination and amendment of agricultural research programs. They continue to inquire into the operations of programs and to provide direction through control of appropriations. Nevertheless, they do so with assurance that the research program is being reviewed by persons qualified to judge whether or not the program is responding to practical needs. The recent trend of agricultural research appropriations reflects this improvement.

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[2] A Visualized Program for Marketing. Speech by Congressman Clifford R. Hope before the U. S. Department of Agriculture Graduate School, 1951.

Improved Communications

Advisory committees have clearly contributed to increasing public interest in agricultural research and its potentialities. They have distinctly improved communications between the scientists and people whom the research is intended to help and also between the people concerned with the research and those responsible for federal budgets. This has been a relatively slow process, but the results are beginning to show in greater support of the work.

Both the attitudes and operations of the advisory committees have altered considerably since the committees were started. The same is true of the researchers and administrators in relation to the committees. Experience gained in explaining research proposals and reporting research results to committees has improved the liaison between the scientists and nonscientists.

Not all researchers took kindly to the idea of reporting to and being cross examined by nonprofessional advisory groups. Frequently they proved to be very poor salesmen of their wares. A high positive correlation could be observed among those who didn't like advisory committees and those who experienced trouble before congressional committees.

But advisory committees were able to take more time to listen than could the legislative committees, and tended to be more patient in acquiring an understanding of the researcher's work. When the scientists realized that they were dealing with a basically sympathetic audience in most instances, they appreciated having important recipients of research take an interest in their work. When advisory committee members realized the motivations of the scientists, the objectives they were seeking, the skills they had to offer, the faith and confidence they had in their work despite low pay and criticism, the members experienced real pleasure in becoming acquainted with them and helping them. A spirit of mutual confidence and respect has gradually developed.

Appreciation of the value of advisory committees has grown steadily. Research administrators now actively seek the establishment of new committees to cover work not adequately reviewed by existing committees. Problems of financing and servicing the committees are the main limiting factors. In addition to the costs of travel and per diem of committee members (averaging about $1,500 a meeting), the time and effort of scientists and administrators who confer with committees plus the stenographic, secretarial and other help required to plan, arrange, record and report meetings must be taken into account. Unless these services are adequately provided the usefulness of committees fall short of their potential, especially from the standpoint of exchange of information and points of view.

Activities Altered

At the outset it was thought that the advisory committees would be a major source of research proposals brought to the Department. Over time the committees have tended to rely more upon researchers to originate proposals. While committees continue to present proposals, they function more in evaluating the relative importance of problems and ideas that come to them from a variety of sources, but mainly from research agencies.

In the beginning, many committee members exhibited the natural tendency of businessmen to assume administrative functions. With recognition that responsibility for decisions must rest with administrators and responsibility for devising research projects and methods to solve recommended problems must rest with the scientists, committee members have functioned more in a truly advisory capacity.

Advisory committees exhibit characteristic reactions to different types of research. Although reactions are not entirely uniform, in general committees tend to favor applied research over basic research, short time research over long time research, biological and physical research over social research, and service types of research over theoretical research. These tendencies are tempered considerably as members become more familiar with potentialities and prospects for the different types of research as well as with the need for balanced programs. It is not unusual now for fundamental scientific work to receive a high priority rating from a committee, especially where the members have acquired respect for the qualifications of the scientists who are scheduled to do the work. A similar observation can be made with respect to economic research. It will probably surprise economists to note that the Food Distribution Advisory Committee at its last meeting gave highest priority to studies of costs and margins.

As committee membership has been rotated to provide for wider participation and new blood, recognition has been given to the need for representation of research technicians and administrators on the committees. Such representation advocated frequently by scientific agencies has been drawn from nonfederal sources and now appears on most committees, but it has been maintained as a distinct minority representation. Otherwise the very effective jobs advisory committees are performing in assuring greater practicability of research, increasing public confidence, and achieving broader understanding and interest in agricultural research could be jeopardized.

Recommendations are reported by the committees on the basis of their appraisal of proposals for new work and progress of going work. The reports are circulated to all state and federal agencies participating in the

program of the Research and Marketing Act. Agricultural research agencies in the U. S. Department of Agriculture take these recommendations most seriously and endeavor to respond to them. Response is encouraged by the degree to which the annual budgets are built upon the foundation of these recommendations.

On the whole, the foresight of agricultural leaders in providing for advisory committees as a means of stimulating and improving research has been vindicated. The effects have not been confined to the Research and Marketing Act program because it was soon recognized the R.M.A. work could not be reviewed and expanded independently of research financed from other sources. The advisory committee members have been invited to examine all phases of the Department's research and associated activities. This has extended the committee influence to all phases of related work.

Although extension and service programs and nonfederal research programs are not reported to the research and marketing advisory committees to the same degree or in the same detail as federal research, there is little question that they are benfiting from the more sustained interest in agricultural research and associated activities instilled by the committees.

For most committees the membership can be regarded as a good cross-section of the clientele being served by the respective areas of research. With representation of farmers, farm organizations, geographic regions, and different types and sizes of related marketing firms, the committees are in position to express views of the various groups on whom the research under review may have impact.

These views provide useful guidance on administrative problems. Inasmuch as several agencies in the Department of Agriculture report to each committee, the members acquire a perspective simulating that needed by those holding broad administrative authority. Committee review has, consequently, contributed significantly to coordination and integration of activities between the reporting agencies as well as between scientists of different disciplines, between programs of different government agencies, and between industry and public research agencies. They have exerted influence through their recommendations toward more comprehensive and balanced approaches to problem solution. This is important in view of the fact that agricultural research can no longer be regarded as the work of individual geniuses.

In dealing with administrative matters there is always some risk of having committees reflect in their recommendations the fixed views or opinions of a few dominant committeemen with specific objectives not necessarily consonant with public service activities. On the other hand,

committees effectively direct administrative attention to the need for over-all blueprints of work extending across the jurisdictions of agencies appearing before them. This approach points up strengths and weaknesses of existing programs and indicates opportunities for planned future development to bolster the weakest links.

In any event the expressions of advisory committees on administrative matters must always be regarded as only one of several points of view or types of appraisal that should be taken into account by administrators in decision making. It is the point of view that will probably give major emphasis to the relative importance and immediacy of problems before industry requiring solution.

Other points of view include: (1) those of administrators having immediate supervisory responsibilities who will tend to give greater emphasis to availability of facilities, equipment, personnel and other resources available to them for work on proposed research; (2) those of the scientists or researchers themselves who will place greater weight on what they would like to do, what research tools or techniques could be used, what work would offer opportunities for acquiring new scientific knowledge; (3) those of legislators, particularly on related committees, whose types of emphasis have already been discussed; and (4) those of budgetary officials who emphasize conservation of public funds.

These points of view are usually conflicting in some degree because of the variable weights placed upon relevant factors by the different groups. Good administration gives due consideration to all the factors, adjusts for variable emphasis placed upon them, and reconciles the differences to the fullest extent possible. In the crucible of program formulation the advisory committees supply an important ingredient.

In summation, the contributions of advisory committees to improved communications, more thorough program appraisal and more broad-gauged administration add up to a tidy total well worth the cost.

WHAT CAN A RESEARCH MAN SAY ABOUT VALUES?*

GEOFFREY SHEPHERD†
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RESEARCH men in economics continually run up against the problem of value judgments. Economists can show on an objective basis, using marginal analysis, what is the optimum allocation of productive resources—that is, the allocation that will maximize the production of the goods and services demanded by consumers, with a given distribution of income. They can show the same thing concerning the distribution of an individual's income, given his wants for the different goods and services. But economists generally take the position that they cannot show on an objective basis what is the optimum distribution of income among the individuals in a society, nor what is the best structure of wants for any individual.

The reasons given for this position are two in number: (1) Appraising the distribution of income among individuals requires interpersonal comparisons of utility, which cannot be made objectively. (2) The structure of wants for any individual depends upon his value judgments, which lie outside the field of economics.

Accordingly, economists find it difficult to determine objectively how far the nation should go along the road of economic efficiency, for example, if increasing efficiency decreases security, or how far social security should be carried if it reduces incentive, or—in agricultural economics—how far stabilization programs should go in reducing instability.

This exclusion of economic science from problems involving value judgments is not mere academic matter. Billion-dollar programs depend upon these judgments, and millions of jobs—sometimes including the job of the research man himself. But most economists maintain that science can say nothing about value judgments.

In the last paragraph of an earlier paper in this *Journal*[1] I indicated that I had some questions to raise about this position. That is the purpose of the present paper.

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* Journal Paper No. J-2810 of the Iowa Agricultural Experiment Station, Ames, Iowa, project No. 1241. This is the second half of an article on research in agricultural price policy. The first half was published in the May 1955 issue of the *Journal of Farm Economics*.

† I am indebted to my colleagues John Nordin and Earl Heady for constructive comments.

[1] "What Can A Research Man Do in Agricultural Price Policy?" *Journal of Farm Economics*, Vol. XXXVII:2, May 1955.

Orthodox Position

First, we may state the generally accepted orthodox position of most scientists concerning values.

Here perhaps are the clearest and strongest statements of this position:

"Economics is the science which studies human behavior as a relationship between ends and scarce means which have alternative uses."[2]

"The economist is not concerned with ends as such. He is concerned with the way in which the attainment of ends is limited. The ends may be noble or they may be base."[3]

"Economics cannot pronounce on the validity of ultimate judgments of value."[4]

"Economics deals with ascertainable facts; ethics with valuations and obligations. The two fields of inquiry are not on the same plane of discourse."[5]

Many scientists in other fields hold similar views.

"Scientific positivists" express their views somewhat as follows:

"Scientific method reports what is, not what ought to be; it can discover social pressures, but not moral obligations; it verifies statements about the desired, and the most efficient means for securing it, not about the desirable in any further sense."[6]

Another view, of a similar general nature, is put in these terms:

"Reason . . . can tell us whether our estimates of value are logically consistent, and inform us concerning the causal means best suited to further the ends we have in view. The means are properly judged as good, however, only if the ends are good, and on this point 'reason' has no jurisdiction, for 'ultimate ends recommend themselves solely to the affections,' or, as a more modern version of the same doctrine would say, to the primary 'drives' which determine what the organism desires and on what conditions it can be satisfied. And since the means derive their goodness only from the end they serve, we can see why Hume should conclude that, in the field of morals, 'reason is and ought to be the slave of the passions.' "[7]

Another statement agrees with this:

"though knowledge is undeniably power, the moral ends for which that power is used cannot be determined by the science of human relations any more than they can be by natural science."[8]

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[2] Lionel Robbins, *The Nature and Significance of Economic Science*, Macmillan, 1940, p. 16.
[3] *Ibid*, p. 25.
[4] *Ibid.*, p. 147.
[5] *Ibid.*, p. 148.
[6] Arthur E. Murphy, *The Uses of Reason*, Macmillan, 1943, p. 145.
[7] *Ibid.*, pp. 97-98.
[8] Louis Ridenour, "The Natural Sciences and Human Relations," *Proceedings of the American Philosophical Society*, 92:5, Nov. 1948, pp. 354-355.

And still another:

"The sense of value that is the basis of choice and freedom lies in a realm that science does not touch . . . freedom in its most essential sense is something of the spirit, and . . . this something of the spirit is beyond the realm of Science."[9]

That is to say, according to the orthodox view: Science can appraise means, but not ends. It cannot make value judgments. For instance, it cannot objectively put a higher value on freedom than on security, or vice versa; that is up to the individual. Science cannot help us to make ethical judgments. Science can tell us how to get to where we want to go, but it cannot tell us whether we ought to want to go there in the first place. It cannot say: this is good, and that is bad. Science says: if you don't like spinach, that's all there is to it. *De gustibus non disputandem est.*

Science and Ethics

The preceding section is full of words like "ends," "values," "good," "should," and "ought." These concepts lie in the field of ethics. "Ethics . . . is not concerned mainly with bare facts but with values . . . not with the actual character of human conduct but with its ideal, not so much with what human conduct is as with what it ought to be."[10]

The student of this field of ethics soon finds that science has a good deal to say about what ethics is, even if science cannot help us make ethical judgments.

Cultural anthropologists tell us that ethics is not something that is already in existence and waits merely to be discovered, like Pluto, or the laws of gravitation, or America in 1492. It is not something that was here before we came, and will be here long after we have gone, like the earth under our feet. Ethics is rather something that we build up as we go along. Ethics is what we want it to be. It is not objective; it is subjective.

These scientists point out that revelation, religion, conscience, superstition, magic, or authority based on any of these, is not a solid basis for ethics. They say that the real basis of ethics is deep-seated human longings and aspirations. This is the only basis that stands up under the test of rational thought. The best system of ethics is the one that most fully satisfies these human longings and aspirations over the long run. "Good" is that which is good to satisfy human wants. "Right" is that which promotes their satisfaction; "wrong" is that which hinders it. We "ought" to do that which will most fully satisfy human wants.

Most deep-seated human wants are common to all men, but many—monogamy, for example, or polygamy, or polyandry, or top hats—are

[9] A. H. Compton, "Science and Human Freedom," *Symposium on Human Freedoms*, Coe College, Cedar Rapids, Iowa, 1952, pp. 5, 10.

[10] *Encyclopaedia Britannica*, "Ethics."

determined by the culture in which men live. Our culture endorses monogamy; one of the books in our college library is entitled "Isn't One Wife Enough?" (the author, surprisingly enough, is a Young). But some Tibetans think it selfish for one husband to have a wife all to himself. The Arapech go the other way; they consider it noble and self-sacrificing to have three wives each.[11] I am informed that the natives in one part of Africa used to fish naked. The missionaries were horrified; they got the natives to wear clothes; and what happened? The natives caught cold in their wet clothes, and many died. Their original system of ethics was better for them than ours.

Ethics, therefore, is not something that is absolute, eternal; ethics is relative to our culture, relative to our time and place. It differs from culture to culture at any one time, and it differs from time to time in any one culture. There is no absolute standard of right and wrong.

". . . the diversity in moral standards is so great that no man could act rightly according to any specific moral code that has ever gained wide acceptance without offending against some of the precepts of other codes which are felt to be no less binding for those who accept them. Hence, in this sense what is right for one is wrong for the other, and there is no common standard, acknowledged by both, in terms of which this difference can be adjudicated."[12]

There is no evidence, either, that the universe, or man, is teleological in nature,[13] driving or being driven purposively toward a predetermined end—to "one far-off divine event, to which the whole creation moves."

These pronouncements about ethics are based on empirical data, subjected to scientific scrutiny. But when we ask scientists if they can help to build the subjective, relative, want-satisfying system of ethics that they have prescribed, they retreat into their orthodox bomb shelter. Science, they say, cannot deal with ethical problems at all. Ethics, as the Encyclopedia Britannica says in the quotation given earlier, deals "not so much with what human conduct is as with what it ought to be." It deals with the morally right and wrong. And scientists tell us that these matters lie outside the field of science.

They agree that the basis of ethics is human wants. But they bow themselves out of the field of wants, on these grounds: I want sugar in my coffee; you don't; and he doesn't want coffee at all. Now, they say, science shouldn't attempt to say that I or you or he should want sugar or no sugar or no coffee at all. Look what happened to prohibition; science showed that alcohol is injurious, but prohibition had to be repealed because people didn't want it.

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[11] Margaret Mead, "What Is Human Nature?" *Look*, April 19, 1955, p. 57.

[12] A. E. Murphy, *The Uses of Reason*, Macmillan, 1943, pp. 154-156. See also Ruth Benedict, *Patterns of Culture*, Houghton-Mifflin, 1934.

[13] G. Simpson, *The Meaning of Evolution*, 1949.

Nobody in this democratic United States, they say, would want a scientist dictator to tell us that we've got to have prohibition whether we want it or not. If a man wants something, no amount of reason will convince him that he ought to want something else. Wants are basic. Reason is and ought to be the slave of the passions. Science can say nothing about wants, and therefore it can say nothing about ethics, which is based on wants.

Obsolescence of Philosophical Concepts

It seems to me that this is all wrong.

We as scientists *can* deal with ethical problems, if we examine our ethical concepts, most of which were developed in a prescientific age, and bring them up to date.

In earlier times, men appealed to revelation, or divine authority, or both, or to some assured "categorical imperative" conjured out of air. But in an age of science, men are learning to build their systems of ethics on more solid, testable, pragmatic grounds.

In this endeavor we are hampered even in our own thinking by the normal cultural lag in the use of words and concepts. Our concepts are lagging behind our progress.[14]

Ethics used to be thought of as a set of rules of behavior, existing in nature independently of mankind, as it were, like the moon. And there

[14] "Ethical theory began among the Greeks as an attempt to find a regulation for the conduct of life which should have a rational basis and purpose instead of being derived from custom. But reason as a substitute for custom was under the obligation of supplying objects and laws as fixed as those of custom had been. Ethical theory ever since has been singularly hypnotized by the nation that had business is to discover some final end or good or some ultimate and supreme law. . . . It long seemed as if rational assurance and demonstration could be attained only if we began with universal conceptions and subsumed particular cases under them. . . .

"Two ethical consequences of great moment should be remarked. The belief in fixed values has bred a division of ends into intrinsic and instrumental [or in current terminology, into ends and means] of those that are really worth while in themselves and those that are of importance only as means to intrinsic goods. Indeed, it is often thought to be the very beginning of wisdom, of moral discrimination, to make this distinction. Dialectically, the distinction is interesting and seems harmless. But carried into practice it has an import that is tragic. . . . No one can possibly estimate how much of the obnoxious materialism and brutality of our economic life is due to the fact that economic ends have been regarded as *merely* instrumental. When they are recognized to be as intrinsic and final in their place as any others, then it will be seen that they are capable of idealization, and that if life is to be worth while, they must acquire ideal and intrinsic value. Esthetic, religious and other 'ideal' ends are now thin and meagre or else idle and luxurious because of the separation from 'instrumental' or economic ends. Only in connection with the latter can they be woven into the texture of daily life and made substantial and pervasive. The vanity and irresponsibility of values that are merely final and not also in turn means to the enrichment of other occupations of life ought to be obvious. . . .

was presumed to be some obligation upon each individual to measure up to these rules of behavior. Men ought to be ethical. Why? Because it was right to do so, and men ought to do right.

This appeal to some external ethical code on an assumed obligation to live up to it may have been useful in early times, but it has outlived its usefulness today. In our present age of science, there is less inclination now to accept any code handed down by revelation or authority, and more inclination to test any code by operational criteria and build it up on a pragmatic basis. We ask: Why ought we to do this or that? How do we know what we ought to do? How do we know what is good and bad? What does good and bad mean in an age of science? What obligations do we have? What does obligation mean today? What is a pragmatic basis for ethics?

The answer to questions of this type is plain: In an age of science, "good" means good to satisfy human wants. "Bad" means the opposite. And "ought" is a term that is no longer quite relevant. There is less inclination now for men to exhort each other that they ought to do this or that. The United States now does not rely on a moral obligation for each citizen to be patriotic and bear arms for his country. Instead, Congress considers the country's military needs, pays men well enough to induce them to go into the army or navy or air force voluntarily—not under any moral compulsion, but just as they would into any other paying job. Beyond that, in time of hot or cold war, men are not urged to volunteer; they are drafted, in sufficient numbers to swell the voluntary army to an adequate size to meet the emergency.

Similarly in the field of public welfare. The term *noblesse oblige* used to be employed to refer to the obligation of the rich to take care of the poor. But the term is no longer used in our democratic society today. Instead, taxes are levied. These taxes are mostly progressive, not on moral grounds, but on such economic grounds as ability to pay. The country does not rely on a general belief that a man ought to pay his taxes; it relies on the police power of the state. Moral obligation based on religious authority is replaced by legal compulsion based on pragmatic grounds.

Values Lie in the Realm of Science

We saw earlier that the basis for ethics is the fullest satisfaction of deep-seated human wants. When the ethics is freed from its ancient aura

"The other generic change lies in doing away once and for all with the traditional distinction between moral goods, like the virtues, and natural goods like health, economic socurity, art science, and the like. . . . Inquiry, discovery take the same place in morals that they have come to occupy in sciences of nature. Validation, demonstration became experimental, a matter of consequences." (John Dewey, *Reconstruction in Philosophy*, Holt, 1920, pp. 161, 166, 170, 171, 172, 174.)

of the supernatural, all there is left is fundamental human wants—and that is enough. That is all there is to go on, and that is all there needs to be.

But these wants are not sacred, immutable, and unconditional, as the orthodox scientific view holds. For many wants conflict and they cannot all be satisfied in full measure. If a man wanted only one thing, unconditionally, there would be no place for the use of reason. Reason would then indeed be the slave of the passions—or more accurately, the slave of the one overriding passion. But it is obvious that a man wants many things, and that some of these wants conflict. They cannot all be satisfied in full measure. The degree of satisfaction of each has to be determined by the use of reason, on some such grounds as the equivalence of marginal satisfaction.

Ethical Values Are Built Up

A profound philosopher, a lifelong student and teacher in the field of comparative religion, concludes that "there are no peculiarly religious values."[15] In that same sense we may say that there are no peculiarly ethical values. That is, there are no values handed down to us from above. There are only values that we build from the ground up, out of our lives and cultures. And in this building up, science has an important and indeed essential part to play.

In this context, a research man does not attempt to say that another person or group of persons ought to do this, or that; he only says that if the person or group does this, or that, such-and-such will happen. He leaves the person or group free to choose among these consequences according to his values.

These values, however, are not sacred or immutable. They are subject to the same sort of analysis as means. If a person values freedom more highly than security, the scientist does not say that he ought or ought not to do so. The scientist merely points out the consequence of that value judgment. Freedom beyond a certain point means anarchy; security beyond a certain point retards progress. If a person then says, "But still I like to go through stop-lights," the scientist does not say "That is your value judgment, and science can say nothing about it." Instead, he attempts to educate the man to change his values; he points out that the man's actions will result in damage to other cars and persons, and if that does not change the man's values and his actions, the judge takes away his license in the attempt to stop his driving altogether. If that does not do the job, the judge puts him in jail.

[15] Eustace Haydon. *The Quest of The Ages.* Harpers, Preface, p. XII. Mr. Haydon was head of the Department of Comparative Religion, at the University of Chicago.

This can be put into more rigorous terms, using the concept of production-possibility curves and indifference curves, along with the concepts of means and ends. My good colleague and friend, Earl Heady, has done this recently in a diagram which measures profits up the vertical axis and nonmarket goods along the horizontal.[16] He points out that farm management education can help a farmer shift his production-possibility curve upwards; sociological education can help a farmer shift it to the right. Either of these shifts can put the farmer on a higher indifference curve, but neither of them affect the indifference curves themselves.

I believe now that research men can go one step further.

To my mind, research men can not only appraise (in the sense of "show the consequences of") the means (the production techniques the farmer is using) and show how the adoption of new techniques would move the farmer's production-possibility curve up where it would be tangent to a higher indifference curve; they can also do the same sort of thing for the ends—that is, for the values that determine the position of the indifference curves. Research men can show a farmer how he can adopt different values and change indifference curves.

Let us take a simple example. The farmer may like to get in his car and go roaring down the road at 100 miles per hour. But education teaches him what damage that is likely to do to the machine, to others, and to himself; he soon learns to change his values (which determine the position of his indifference curves) accordingly. He changes his own set of values himself. He makes the change as the result of educational activities. He is free to retain his old values; but if he does so, he will not remain free (in another sense) for long. He may lose his driver's license, or land in jail, or in the hospital, or under the sod.

Or consider the farmer's wife. Perhaps she is one of those people who just love to eat. Do nutritionists then say, "That is her value system, and science can say nothing about it, and furthermore science should not try to do any thing about it?" They do not. They bombard her with nutritional and health education about the consequences of obesity—its shortening effect on life, for example—in a strong effort to get her to change her values.[17] The wife who loves to eat, who values eating highly, learns to value eating less highly.

Or, to come right down to agricultural price policy. We observe that farmers want price stability, but we do not conclude that, since that is their value judgment, economic science can say nothing about it. We

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[16] Earl O. Heady, *Fundamental Economic Framework for Farm and Home Planning Programs.* February 17, 1955, Dittoed.

[17] P. Swanson, E. Willis, and P. Mairs, "Overweight—a Problem Among Iowa Women," *Iowa Farm Science,* Vol. 9:11, May 1955. pp. 18-20.

observe that farmers want freedom and progress as well as price stability, but we do not conclude that since those are value judgments too, economic science can say nothing about how those conflicting values can be reconciled. Instead, economists and statisticians get together and construct parity indexes and compute parity prices that move up and down with inflation and deflation. And when the bases for those parity prices become obsolete, research men cudgel their brains and come up with modernized parity. Still later they come up with flexible price supports, pointing out that these provide a workable measure of stability and freedom and progress too.

Research Men Can Appraise Ends as Well as Means

I think one can safely say that the ultimate end of all research and education is to change the student's reactions, indifference curves, and values from those of a primitive savage to those of a civilized man, and to give him the training that will enable him to attain those values as fully as his intelligence and the level of technology permits.

But in a democracy, scientists do not try to impose their system of values on their audience. A dictator does. A dictator makes up his mind what he wants and imposes what he wants on the people. A religious man tells people what they ought to do, in the light of some eternal moral principle from on high, a compulsion or obligation imposed upon people from above that they ought to obey. But research men and educators in a democracy help people make up their own minds and change their own values, in the light of the scientific information concerning the consequences of alternative value judgments and the training in objective evaluation which science provides.

Research men, then, far from having nothing to say about values and morals and ethics, have a great deal to say about them. They can help people appraise ends—appraise in the sense of "show the consequences of"—just as well as they can help them appraise means. They are doing it every day. Wants and desires furnish the drives to action, but science and reason test these drives, and modify and channel them into systems of behavior that enable men more fully to satisfy those desires under conditions of civilization. Science and reason are hampered by tradition handed down from earlier times, hindered by emotionalism, and retarded by ignorance; but they are the solid basis for values. One of the legitimate purposes of research and education is to show the consequences of alternative value judgments, as well as of means, and thus help people to change their values in directions that will enable them more fully to satisfy their wants.

SOCIAL SECURITY IN AGRICULTURE: A PRELIMINARY APPRAISAL OF ITS OPERATION, IMPLICATIONS, AND EMERGING PROBLEMS*

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THE 1954 amendments of Old-Age and Survivors Insurance extended coverage to 3½ million farmers and to more than 2 million additional farm laborers.

The extension of OASI may result in a number of economic problems arising from its effect on land ownership turnover, transfers in operation, and purchases by nonagriculturists; its effect on farm size and nature of part-time farming operations; its effect on the supply and combinations of factors in agriculture; and from resulting changes in retirement plans, personal reserves, and capital formation.

What will be the position of agricultural economists in dealing with the new problems arising from the extension of social security? Two types of inquiry appear to be necessary: (1) short-term studies directed toward the remedial measures necessary for adjustments in agriculture to the new institutional framework and (2) long-range studies that will indicate the impact on the economy of the OASI program and will, in the formulation of remedial hypotheses, consider the program itself as a variable.

Before hypotheses are formed and schedules taken, however, some time should be spent by economists in acquainting themselves not only with the details of social security law[2] but with the fundamental objectives and the economic nature of social security programs in general and Old-Age and Survivors Insurance in particular.[3]

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[1] The opinions expressed in this article are those of the author and do not necessarily represent the views of the Production Economics Research Branch, Agricultural Research Service, or the U. S. Dept. of Agriculture.

[2] This paper is not intended to present a systematic description of the details of the OASI law. A reader who desires such information should consult Senate Document 157, *Compilation of the Social Security Laws*, Washington, D.C., 1955; OASI-35 Your Social Security, 1954, and OASI 25a, *Farm Families and Social Security*, 1955, U.S. Dept. of Health, Education, and Welfare.

[3] Two articles may be recommended in this connection: Jo Bingham, "Social Security: Fair Words or Buttered Parsnips," in Glen Hoover, *Twentieth Century Economic Thought*, Philosophical Library, New York, 1950; and Eliot J. Swan, *Economic Aspects of Social Security* (Housing, Social Security and Public Works), Post-war Economic Studies, Federal Reserve System, Washington, 1946.

Social insurance and the OASI program

The objectives of the social insurance program in the United States are not so well defined that they can be isolated finally here.[4] Apparently, however, one of the objectives of social security is that the OASI program attempts to provide minima of economic security for different groups of beneficiaries. In attaining this objective the program may be expected to affect the distribution of income and the allocation of resources.

For purposes of economic analysis, the degree of attainment of the objectives may be weighed on the basis of their effects on the total output of goods and services, in value terms.

The benefits and the costs of the program do not appear to fall equally upon all persons affected by the program. To the extent that the ratio of benefits to costs is not the same for all individuals there will result a transfer of income. Insofar as the transfer of income influences the quantity, combination, or employment of resources, it may affect the level of output of goods and services. The use of an economic standard provides a means for indicating the extent to which attainment of objectives of the social insurance program is consistent with increases in, or requires a sacrifice of, the output of goods and services.

Some aspects of OASI as insurance and annuity

To what extent is Old-Age and Survivors Insurance insurance? If insurance is strictly defined to mean an arrangement wherein many individuals each contribute their resources voluntarily to a pool in an amount such that the premium that each pays will be equal to the amount of benefit times probability that a specific event will occur plus the prorated costs of administration, OASI would not qualify. Its premiums are compulsory, in the nature of a tax. The amount of the OASI tax is not contingent upon the type or amount of benefits desired or received by the taxpayer, but rather upon his income.

The "insurance" benefits are not paid solely on the basis of the occurrence of the event for which the taxpayer was insured—death. Two young men may each pay $126 a year premium for 10 years and die on the same day. The wife of one may receive an annual income of $1,953.60 per year and the wife of the other nothing (until she reaches 65). The sufficient condition in this case was either a child or old age.

[4] Meriam commented in 1946: "Examination of existing programs and the literature in the field discloses no well-defined consensus regarding objectives either among proponents of social security systems or among legislators. On the contrary, there are divergent and often conflicting points of view." Lewis Meriam, ***Relief and Social Security***, Brookings Inst., Washington, 1946, p. 558.

Is Old-Age and Survivors Insurance an annuity? If an annuity is a form of insurance in reverse, then many of the same characteristics may be found as in the insurance aspects of the program. After contributing to a fund for a number of years, the would-be recipient of retirement payments must indicate his incapacity or unwillingness to perform a productive service yielding income in excess of a specified amount in order to collect benefits. Again there is the implication of *need* as a criterion for the receipt of benefits. Although income transfers are depersonalized, the basic *need* concept is an integral part of the OASI system. So long as directed or intended income transfers (other than those that occur randomly) are part of the OASI system, it cannot strictly be considered either insurance or an annuity. Because there is some relation between the amount of contribution and the benefits, the program has an insurance or annuity-like aspect. However, from the standpoint of economics rather than of accounting, the effects of the redistribution of income on the allocation of resources appear to be of primary concern.

Income redistribution aspects

The program of social insurance has differential effects on various classes of beneficiaries, such as young and old persons; high-income and low-income taxpayers; single persons and families; working women who marry and other beneficiaries; contributors who fail to meet eligibility standards and other beneficiaries; and employees, employers, and self-employed. In some instances, the nature of the income redistributions is reasonably clear, in others, it is less so.

Some of the more spectacular effects are those that may be expected to occur in the first year or two of the program. These effects are essentially a result of the decision to bring the program to 65-year old persons immediately. First, there will be an initial transfer of income resulting from the eligibility of farmers 65 years of age or older who will qualify after only 6 quarters of continuous coverage since the passage of the amendment in September 1954. There are approximately 750,000[5] farm operators 65 years of age or more. If they meet the other requirements for eligibility, these farmers will qualify for benefits in the third quarter of 1956. Compared with the costs, the benefits are very favorable for farmers who are near retirement age. For example, a married farmer who reaches 65 or over late in 1956 may, by having paid social security taxes of $18, receive an annuity valued at $6,750[6] plus survivor and death

[5] Estimates based on Seventeenth U.S. Census.

[6] Annuity values are calculated on the basis of the purchase price of an immediate annuity purchased at age 65. The cost is approximately $1,000 per $80 annual benefit.

benefits.[7] The annuity for the farmer if he were taxed on the income maximum of $4,200 would be worth $24,400. For the latter annuity his outlay would be $189, representing a return on investment of almost 13,000 percent.

If all farm operators over the age of 65 were to qualify for retirement benefits even at the lowest level,[8] payments would exceed $360 million in the first year. This, of course, does not include the insuranc benefits payable to survivors in agriculture or the lump-sum death payments. The total annuity value of benefits available to all farmers over 65 calculated on the minimum income basis would be more than $3.6 billion and if calculated on the maximum income basis the annuity value would be more than $12.5 billion.[9]

The recent social security amendments appear to be very remunerative for older farmers. On the other end of the age scale, however, are young farmers who must, until they are 65 years old, pay the social security tax for any year in which their net income exceeds $400. A young man who began farming in 1954 at the age of 22 and who had $4,200 or more net income each year would pay until he reaches 65 a total of $9,261 in social security taxes. When these costs are compounded to age 65 at a bond rate of 3 percent over the period in which he pays the taxes, the projected cost of the program to the young man is $26,832.[10] The retirement payment that he may look forward to is, of course, the same as that of his elder counterpart.

Some indication has been given of the transfer of income to retiring farmers from younger taxpayers. The program also has a differential effect on various income levels.

The income transfer effects of the OASI taxation scheme may be seen

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[7] The death benefit of 3 times the primary insurance amount ($30) would be an additional $90. Assuming the wife survived the husband by 5 years, an additional $1,800 would be paid at the rate of $30 a month.

[8] Assuming that 70% of the operators are paid on the "worker and wife" basis of $45 per month and the remainder on the $30 per month basis. Approximately 70% of the U.S. males age 65 and over were in "married" status in 1953.

[9] The annuity values were calculated on the basis of the age breakdown of rural males over 64 as given in the U.S. Census of Population 1950. Bul. P-C.

[10] He may, however, receive protection for his survivors which varies according to the number of his dependents at the time of his death. The most generous benefit possible is $200 a month, or 80 per cent of earnings base, which even is lower. In addition, his survivor will receive a lump-sum death payment. But the insurance of OASI has some rather serious limitations. The young man derives no insurance benefits from payment of his taxes unless he has (a) a wife over 65, (b) a wife caring for a child under 18 years of age, (c) a child under 18 years of age, or (d) a dependent parent over 65. If he does have a wife and child, however, he secures an insurance coverage of $1,954 per year until the child becomes 18. Even after this allowance for the insurance benefits most young men could show a much larger payment for their retirement than can persons who become fully insured for $18 to $189.

in a comparison of taxes and benefits. It can thus be shown that persons on the lower end of the income scale pay about half as much for their benefits (or, conversely, the same price for twice the benefit) as persons on the upper end of the income scale.

Average monthly earnings	*Tax at 3 pct.*	*Worker & wife old-age monthly benefit*	*Tax to benefit ratio*
$ 45	$ 1.35	$ 45.00	1:33
150	4.50	102.80	1:23
250	7.50	132.80	1:18
350	10.50	162.80	1:16

Other types of income redistribution are at least worthy of mention. Single persons without dependent parents 65 or older, and young married taxpayers without children, receive no insurance benefits from the program. Their taxes are contributed to the pool, from which they draw nothing. When working women marry, they lose either the wife's benefit (half of the husband's benefit) or their individual benefit, whichever is lower, and to this extent they are disadvantaged compared with non-working women who marry without contributing to social security taxes. Contributors who fail to remain in a covered employment or who otherwise disqualify themselves for benefits after the payment of taxes may also pay more than they receive. Perhaps even more significant from the standpoint of the effect on resource allocation is the differential between the rate of taxation on self-employed and on employees. The net return to, say, labor in self-employment in contrast to the net return to labor as an employee depends first on whether the incidence of payroll taxes is shifted—to the employee, the employer, or the consumer. To the extent that the tax on labor is shifted to the enterprise in the form of higher costs of labor, it will induce substitution of capital for labor.

A program of long-run research, in addition to indicating the nature of income transfer effected by OASI, should provide some basis for estimating the probable effect on the total supply of goods and services available to the nation. As Lewis Meriam said:[11]

> The position of a social security system as such appears to be distinctly secondary and defensive. The real hope appears to be in positive, constructive actions to promote the full functioning of the economy with a high degree of efficiency.

More specifically, agricultural economists will have to deal with production changes resulting from the effects of the program on the availability of land, the supply and mobility of labor, the allocation and formation of capital, firm adjustments in production plans, adjustments in house-

[11] Lewis Meriam, *Relief and Social Security*, Brookings Inst. Washington, 1946, pp. 567-568.

hold budgets, and farm finance among others. Any adverse effects on production become a part of the social cost of the program and need to be weighed against the benefits of the program.

Some Economic Effects of the Extension of OASI

The research problems that arise from the extension of OASI to agriculture appear to divide into the short run and long run because of the purposes for which the research is intended as well as because of differences in impacts of the program. The essential problem in the short run, that is one to two years after the 1954 amendments, is that of adjusting to the program with minimum disruption in the production process. The program is a "given." In the longer run the OASI program itself may be considered a variable and research should be oriented to provide the means for its evaluation and change. The division of problems into short and long run, however, does not imply that long-run research should be deferred for one or two years. On the contrary, short-run research may become an important segment of a broader framework of analysis that can be begun immediately. Studies of particular effects of the program in the short run will be an important source of hypotheses about the long-run effects.

Short-run effects

The short-run effects of the initial impact of extended coverage will result largely from changes in the distribution of income and in the efforts of individuals to maximize gains, or minimize losses, from the program. The initial problems of adjustment will be primarily those of resource allocation rather than of employment or quantities of resources. For purposes of illustration some of the provisions of the OASI program and how they might affect the land tenure structure, farm management decisions, and farm finance may be examined.

The OASI provides for a tax (thus coverage) only on "earned" income. A landlord whose income consists of rental payments only is therefore not covered.[12] If the landlord is nearing 65 it behooves him to take advantage of his very favorable benefit-cost ratio. How may he qualify as a self-employed farmer? Essentially, there are three tenure arrangements to which he might change in order to qualify: Partnership, self-operation, or employer-employee. In order to become eligible for retirement benefits he must reverse the process and return from partner or employer to a landlord status. Thus, two successive changes are required in the tenure arrangement so that the landlord may secure the benefits of the OASI

[12] H.R. 7225 submitted to the House in July 1955 provided that landlords who have "material participation in the production" of the agricultural commodity may be covered under OASI. The Bill had not become law at the time of this writing.

program. The consequences of these changes alone may introduce additional sources of uncertainty into the production plans of tenants. Likewise, many of the makeshift arrangements may cause dissociations of benefits and costs of resource inputs with consequent misallocations of resources.

The simplest tenure change is to personal cultivation by the landlord. Because of the limitations on physical ability of landlords and the capital requirements for farming operations, the self-operation alternative will probably be limited, but it will account for at least some of the adjustments. The change to self-operation is perhaps more likely to be made by lessors who already perform a farming operation and who wish to expand their operations to get maximum coverage from OASI. To the extent that such arrangements are made on part of the farm, parcellation and some of the inefficiencies consequent to the indivisibility or specificity of various factors may result. Tenants who expect to be displaced will decrease their inputs in uses from which the benefits cannot be recovered. Additional costs of production are also incurred as tenants are forced to move.

Many of the stock-share and crop-share arrangements may require only a small adjustment to effect the partnership alternative. The unlimited liability feature of a partnership may cause some landlords and tenants to refrain from using it. The unwillingness of one partner to accept the risks of some types of inputs, e.g., the landlord's liability for the tenant's purchase of new machinery, might cause a reduction of capital inputs and might further aggravate the problem of capital formation in agriculture.

Labor-share and sharecropper arrangements may be transformed into employer-employee relationships in order to qualify landlords for OASI. In sharecropping, where the landlord already owns the capital and makes many of the management decisions, only a short step may be required to effect the change. However, as employers the landlords would be obliged to accept additional responsibilities, including liability for many actions of the employee and the payment of a 2% OASI employee tax. By accepting a strict employee status sharecroppers may be further restricted in participation in management.

Tenants as such are covered as self-employed persons. Landlords may benefit by tenure changes; the tenants have little to gain from the standpoint of gaining coverage under OASI. Consequently, when tenure changes made to cover the landlord result in a loss to the tenant, compensation might be required if the tenant were to be left as well off as before the change.

Since immediate research needs will not permit waiting until the aggregate effects of the program can be measured, most short-run research will

be at the intrafirm level. A point of concentration will be resource allocation in the firm as affected by farm management decisions. The advantage to farmers near retirement age of showing a high income has been shown. Elderly farmers may prefer to secure a high income for a short time to maximize their coverage in OASI, then retire, rather than receive farm income over a longer period of years. Their shortened planning horizons may cause them to discount heavily future income. As a result, in many instances soil conservation plans may be discontinued, heavy cropping practiced, and minimum repairs made to buildings, machinery, and other land improvements.

The social security tax law permits farmers with gross incomes of $1,800 or less the option to report one half of the gross income for taxation purposes. Farmers who elect to report on their gross income will be less concerned with their net and may choose a high-cost alternative means of production if it shows a high gross income. This can be to the advantage of many subsistence farmers and persons who wish to perform nominal farm operations simply to secure the advantages of social security.[13] Resources directed into high-cost production which, under these circumstances, result in high returns to an individual, represent a loss in goods and services to the economy through misallocation of resources.

Another important aspect of the new social insurance will be its effect on farm finance and the consequent effect on the movement and formation of capital in agriculture. The initial effect will be a reduction of income available for capital. Part of the funds that might have gone into, say, land improvements or machinery, are now channeled into the OASI reserve where they will be used partly to pay old-age benefits and partly for other governmental expenses.

The level of taxes and benefits are fixed and an individual cannot select alternative variations to fit his own plan of financing. Individuals must adjust their financial programs to the social insurance system rather than choose an insurance program to fit their individual needs. There is a possibility of substituting the social insurance for some of the current forms of saving (private insurance, land investment) but much current saving is in the form of fixed obligations such as mortgages and life insurance (except term insurance which involves little loss to drop). Additional coverage required by OASI will simply involve an added cost to the farmer which presumably he had failed to undertake individually for lack of either desire or means. The initial impact, at least, will probably be one of reducing income available for capital.

It has already been indicated that the burden of the program will fall

[13] The annuity value of benefits paid on the basis of $900 taxable income is approximately $9,300.

on young persons and those with higher incomes. In terms of evaluating the effects of the program on expenditures for capital in agriculture, information is required which will show the age and income groups that are responsible for capital formation in agriculture.

It has been suggested that funds being used by younger farmers to support parents may be used for production purposes and therefore OASI will not affect capital in agriculture. This is at least open to question and the fact that there is a substantial transfer of income from young persons to old would need to be established. A counter suggestion might be that current transfers from older farmers to young farmers will be partly dissipated through the OASI tax. The OASI program is supposed to substitute in part for the public assistance program, and public assistance presumably admits that children are not able to support parents. There is also the matter of determining whether persons of preretirement ages devote a greater proportion of their income to capital than retired persons. Again, of course, the nature of the program as an income-distributing mechanism comes into focus. A farmer in a particular situation may be better off but, in the formulation of hypotheses, care must be taken not to translate one possible situation in terms of the whole of agriculture. In social security, some are gainers, some are losers.

The fundamental attribute of social security is that it transfers income from some persons to others. Some persons will devote less of their resources to support of their parents but others will be supporting two or three sets of parents. In the short run, when taxes exceed benefits, it appears that income available for capital will be transferred out of agriculture into other uses. The longer run effects of the OASI program on the formation of capital are considered in the following section which introduces some of the problems of quantities, combinations, and employment of resources in the long run.

Long-run effects

After the initial adjustments to the new program have been made, there will remain economic problems of even greater importance though they may be less obvious or dramatic. What will happen to the level of output of goods and services? How might the program induce basic malallocation of resources? What will be the direction and intensity of interindustry resource transfers? Three problem areas in agriculture revolve around the effects of OASI on the quantity and movement of labor, ownership turnovers and use of land; and the formation and allocation of capital. Long-run considerations will also include the level of income and employment.

The initial effect on the quantity of labor in agriculture will probably

be to increase it. Many retired and semiretired farmers will be induced to return to the land in order to obtain coverage. This opportunity for benefits at nominal cost will also deter farmers from retiring until they have sufficient coverage to make them eligible for benefits. During this period the older farmer will want to show as high a return as possible (up to $4,200) because the added income and social security taxes will be small in comparison with added benefits. Beyond the initial period, however, the effects of OASI on the total supply of labor in agriculture are not clear. On the one hand, the program may appear to increase the return to labor in agriculture, by virtue of the retirement benefits. The advantages to low-income farmers and farm laborers particularly, because of the income distribution effects, may be important in retarding the outflow of labor from agriculture. On the other hand the program after the initial period may have a tendency to hurry the process of retirement, removing much of the agricultural labor force over the age of 65. The combination of these two forces may be to decrease labor input in the economy but to increase the proportion of labor in agriculture. If current beliefs concerning the relatively low marginal productivity of labor in agriculture are true, the social security program could affect efficiency unfavorably.

Again, in the land market, the initial impacts may be separated from the long-run effects. With the benefits which may be acquired through self-operation it appears that the effect of OASI will be to reduce the turnover of land holdings until late 1956 or even until 1958. Even then, there is reason to doubt if any substantial increase in the turnover of ownership can be expected because income from rentals does not affect eligibility for benefit payments. Widows also will find little incentive to sell their estates if they can make arrangements that yield them coverage. On the other hand, if farmers are provided adequate payments to meet the demands[14] of their old age they may be more inclined to relinquish control of their farms. The attitudes and values of farmers in "keeping the old homestead" or passing it to their kin will be important, and the reduction in pressure to sell because of financial necessity may result in decreased land turnover. It is possible that the OASI program will tend to reduce ownership transfers in the land market in the long run as well as in the short run.

Hastened retirements and treatment of rental payments as income, which does not disqualify retired persons from benefits, will tend to

[14] This however does not appear to be the intention of the OASI program. Benefits are based on a concept of minimum "needs" rather than "demands" which older persons may have.

stimulate the rental market. An expansion in tenancy may be a means for accommodating an increase in labor in agriculture and a reduction in ownership turnover.

An added problem with respect to land may be that of parcellation and the tendency to diminish the size of the agricultural firm. This situation might arise from the attempts of individuals to get into covered employment, if only in terms of nominal operations. In this respect, it may be remembered that the ratio of benefits to costs is much higher for persons with the $400 taxable income than for persons with the taxable income of $4,200 or higher.

The problem of the agricultural ladder runs throughout many of these economic problems. How will the OASI program affect farmers' retirement plans? How will farmers be able, as Harris[15] put it, to "retreat from farming" and avoid the unhappy consequences of severing their relationship to their farms? The retirement benefits of OASI may allow older farmers to rely less on their land as a source of retirement income. As a result younger persons might move up the ladder to ownership. The additional tax, however, will reduce income available to younger persons for investment. Since it is a compulsory premium, it has the effect of forcing younger farmers to invest in an old-age retirement plan even though it may be to their economic advantage to invest in land or some other asset.

The problems of capital formation and movement have already been mentioned in considering the short-run aspects of the social insurance program. It remains to anticipate what the long-run effect of OASI may mean in terms of capital.

Social security tends in the long run to distribute income from higher to lower income classes. If the usual assumption concerning the relative propensities to save of high and low income groups can be made with respect to OASI, the over-all effect of the program may be that of reducing the rate of capital accumulation.

The income redistribution from young persons to older persons was shown to be one of the dramatic effects of the short period whereby new groups of persons came within the scope of coverage with a relatively small contribution. This distributive tendency between young and old will continue for quite a number of years because of the increasing scale of taxes. For example, a self-employed farmer 55 years old will be able to retire after having paid no more than 3¾ percent of his income but his son, age 24, will be paying at least 5 percent of his income before

[15] Marshall Harris, "Should There Be a Fixed Retirement Age? The Farmer's Viewpoint," *Annals of the Amer. Acad. Polit. and Soc. Sci.*, 279: 80-83, January 1952.

retiring. Therefore, the "short-run" distribution from young to old will continue at least until 1975.[16] Insofar as savings are made by the pre-retirement age groups and spent by the retired persons who devote a relatively large proportion of their income to consumption, the social insurance will have the effect of reducing total savings.

The capital-restricting effects of OASI apply to the economy as a whole as well as to the agricultural sector. If the rate of capital accumulation is reduced in all sectors, the way for agriculture to increase its quantity of capital is to induce transfers from other sectors. But the groups that would be the principal recipients of the income transfer into agriculture, that is, the aged and the low-income groups, are not those from whom savings may be expected.

Old-Age and Survivors Insurance now covers employees and self-employed in all occupations except a few professions such as medical practitioners, architects, and lawyers, with the result that more than 90 percent of the labor force in the United States is directly affected by the program. By 1975, OASI taxes are to be raised to the level of 8 percent of wages of employees (4 percent employee tax matched by the employer). Taxes on self-employment will be 6 percent of net income. In other words, coverage is extensive and it will become increasingly intensive. No doubt the social security program is becoming more important but whether the optimism of James Marquis[17] that OASI "will be more important as a force . . . promoting the economic and social welfare of the nation" is justified remains to be seen.

The Need for Economic Research Arising from the New Program in Agriculture

The problems suggested in the foregoing pages are not intended to be either an exhaustive treatment or an outline for research on the effects of OASI in agriculture. They are simply speculations of some probable effects.

One of the first research needs will be the construction of a framework for analysis of the economic problems. In this regard, attention needs to be focused on both short-run and long-run effects of the program. The development of a framework of analysis assumes more than a knowledge of the features of the law; it requires a thorough grasp of the objectives and the economic nature of social security legislation. After the social

[16] So long as the proportion of persons 65 years of age and over in the population continues to increase and the social insurance program fails to adjust the retirement age upward, the tendency for income to be transferred from young to old will continue.

[17] James E. Marquis, "Old-Age and Survivors Insurance: Coverage Under the 1954 Amendments," *Soc. Sec. Bul.*, 18 (1):3-10, January 1955, p. 10.

security program has been cast in an economic frame of reference, it will then be possible to deal with individual problems as they arise in agriculture.

Short-run research aimed at ascertaining the effects of adjustment to the new program and providing recommendations to minimize any disruptive effects of the new program will include studies to determine the nature and intensity of the reactions of farmers. These studies might include, for example, changes in tenure, management practices, farm finance, and marketing plans. Information and experience gained from these initial studies may then be used to determine problem areas and hypothesis relevant to longer run effects.

Long-run research should help those responsible for legislation to determine the costs and benefits of the program in terms of goods and services gained or foregone. On this basis the public may make a wiser decision concerning the structure of its social security program.

HOW WELL DO AUCTIONS DISCOVER THE PRICE OF CATTLE?

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Introduction

FARMERS began selling cattle and calves at organized auctions in the United States more than a century ago.[2] Since then, regularly scheduled auction sales have become one of the five major types of market outlets for livestock. The remaining four types are (a) packers buying direct from farmers, (b) local dealers including truckers, concentration yards, commission men, shipping associations, etc., (c) commission men trading at terminal and public stockyards, and (d) farmers trading directly with other farmers.

The number of farmers using each type of market outlet and the proportion of animals sold through each of them varies widely among states and classes of animals. For example, farmers in the Pacific Coast states sold only 18 percent of their cattle and calves at auction in 1949,[3] whereas only a year later Alabama farmers sold 76 percent of their beef animals through this type of market outlet.[4] Similarly, farmers in the western part of the country used auctions more frequently for the sale of beef cows and calves than for steers and heifers.[5]

Livestock auctions have been studied by many researchers. A rather extensive literature on the subject is comprised of excellent descriptions of the physical facilities and operations of auction sales and a rather elaborate evaluation of the auction as a market institution. On the other hand, relatively little work has been done on evaluating the efficiency of the marketing services rendered by livestock auctions.[6]

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[1] Florida Agricultural Experiment Station Journal Series, No. 391. An earlier draft of this paper was read before the Marketing Section of the Association of Agricultural Workers in Louisville, Kentucky, February 9, 1955.

[2] The first recorded auction sale of livestock was held in Ohio in 1836. C. G. Randell and L. B. Mann, *Livestock Auction Sales in the United States*, Bulletin 35, Farm Credit Administration, U.S.D.A., 1939.

[3] Harold Abel and Dee A. Broadbent, *Trade in Western Livestock Auctions, I, Development and Relative Importance of Operations*, Bulletin 352, Utah Agr. Exp. Sta., 1952.

[4] M. J. Danner, *How Alabama Farmers Buy and Sell Livestock*, Alabama Agr. Exp. Sta. Bul. 281, 1952.

[5] Edwin C. Voorhies, *Trade in Western Livestock Auctions, III, Some Factors Affecting Producers Choice of Marketing Agencies*, Bulletin 740, California Agricultural Experiment Station, 1954.

[6] A bibliography on the marketing of livestock meat and meat products lists 34 titles under auctions in the section of Livestock market agencies and channels; only 5 publications on local markets and 15 publications on direct markets are reported. *Bibliographical Bulletin, No. 15*, June, 1951, U.S.D.A., Washington, D.C.

Purpose and Scope

The twofold objective of this paper is (a) to select criteria that can be used in evaluating the market for cattle and beef products, and (b) to tentatively evaluate one segment of this market—the price discovery mechanism provided by three auctions.

The price discovery mechanism provided by auctions was selected for evaluation for several reasons. (1) There is a relatively large number of this type market outlet in the United States (approximately 2,400). (2) Auctions provide a popular—and sometimes the only—market outlet for cattle on the periphery of major livestock producing areas, especially in the southern states where the industry is expanding. (3) For the first time, data are sufficient to make at least a semiquantitative evaluation of the pricing mechanism provided by this type of market outlet in a very limited area.

The "Ideal" Market

Selection of Criteria. Criteria that can be used to evaluate an entire market may or may not be useful in the evaluation of any one segment of that market.[7] Society is primarily interested in the efficiency with which an entire market makes useful goods and/or services available to consumers and secondarily in the efficiency with which any one market function is performed. On the other hand, individuals and firms are primarily interested in the efficiency of one or more segments of the market and only secondarily (and sometimes in the long run) in the efficiency of the market as a whole. To the extent that traders are continually endeavoring to buy at the lowest and sell at the highest possible prices, the short-run interest of the entrepreneurs that comprise an industry are in conflict with society's interest of producing goods and services as efficiently as possible. In the long run, the entrepreneur's interest in market efficiency becomes synonymous with the society's interest under a precise set of conditions that are rarely if ever found in the real world—perfect competition. In this paper, an effort is made to identify criteria that can be used in evaluating the market for cattle and calves within the broad framework of a market that is socially acceptable.

Generally speaking, society evaluates a market in terms of (a) the extent to which prices are determined by a large number of competing firms, and (b) the efficiency with which consumer goods and/or services are produced. In some instances, markets that are comprised of a large number

[7] For example, a packing plant that might be efficient when efficiency is measured by the level of in-plant costs may be very inefficient when measured in terms of the total cost of converting live cattle on the farm into retail beef cuts in the grocery store.

of firms, produce useful goods and/or services efficiently by competing with each other. The markets for stocks, bonds, and commodity futures contracts are both competitive and efficient. On the other hand, there are numerous instances in which freely competing firms cannot (or do not) produce goods and services with maximum efficiency. For example, society prefers to allow a single firm to produce and distribute electric power in a given area rather than to create an environment in which power would be priced higher by numerous firms competing with each other. When the maintenance of a competitive economic environment reduces efficiency, society (1) substitutes administrative boards or formulas for competition as a pricing mechanism and/or (2) uses antitrust and fair trade legislation to protect the public interest.

The theoretical model for a competitive market has been clearly defined as a "perfect" market.[8] This concept of a "perfect" market is firmly rooted in the neoclassical economic theory of perfect competition and hence is a reliable source of criteria for evaluating the efficiency of the components of markets in which society has not sanctioned some degree of monopoly control. The modifications society has made in the perfect market vary widely from commodity to commodity. Consequently, it is necessary to develop a model for a market in each industry—a model that truly reflects the type of a market society considers desirable for that particular commodity or group of commodities.[9] Models of these markets may be called "ideal" markets.

The "ideal" market for cattle and calves. Because beef animals and products can be readily transported and because it is physically possible to store beef products, the market for cattle and beef products is nationwide. In all but one segment of this market, the requisites of a "perfect" market are or could be closely approximated. However, in the case of packing plants society sanctions a high degree of oligopolistic competition and depends upon antitrust and fair trade laws to protect the public against the use of the monopolistic power of the firms that comprise the oligopoly.[10] Thus society has established the broad framework of an "ideal" market for cattle and beef products and the characteristics of this market provide the criteria by which any component of this market can be evaluated.

The fact that society has outlined the framework of an "ideal" market

[8] Shepherd, Geoffrey S., *Marketing Farm Products,* Iowa State College Press, 3rd Edition, 1955, Chapter 2.

[9] Obviously, the model of a perfect market is much more rigid than models of "ideal" markets.

[10] Here it must be noted that simply observing the fact that some meat packing firms have monopolistic power should not be construed to mean that these firms actually use that power.

for cattle and beef products does not mean that entrepreneurs and government agencies have established "ideal" market conditions throughout the entire market. Some of the numerous market centers that make up the national market provide market services more efficiently than others. In other words, they approximate the characteristics of the "ideal" market more closely than others. Deviations from the norms of the ideal market constitute defects in the market and these defects, in turn, are the segments of the market that can be improved on.

The analysis that follows illustrates how the model of an "ideal" market can be used to identify marketing problems. Alternative methods of creating more "ideal" conditions for discovering the price of cattle at auctions will be the subject of a subsequent paper.

Assumptions. The following assumptions are implicit in the analysis:

1. U. S. grades for slaughter cattle and calves are uniformly interpreted and prices accurately recorded by federal and/or federal-state market news reporters in Chicago and the three Florida auctions.

2. Differences among the lows of the ranges of prices paid for the various grades of cattle can be used as a measure of price differentials (1) among grades in the same market, and (2) among markets for the same grade.[11]

3. Chicago prices of the several classes and grades of slaughter cattle are representative of the national market prices before the costs of moving commodities from surplus to deficit producing areas are taken into account.[12]

4. Market prices of comparable cattle should equalize in space at any particular time.

5. Prices are *determined* by the aggregate of all entrepreneural decisions that establish the supply plus the aggregate of all household decicisions that define consumer demand for that particular commodity in an entire market. Entrepreneural decisions that determine supply are made on the basis of anticipated prices with the time period varying from several years to a few days and sometimes a few minutes. Likewise, the decisions that define demand for consumer goods are based on anticipated prices of goods and/or services that will satisfy want and desires. However, con-

[11] Generally speaking, this assumption may be valid but intensive research on (a) the width of range of prices within grades and (b) the variance of prices within the the range will no doubt reveal a better basis for comparing prices among grades and markets.

[12] Additional research may show that this assumption is valid for some classes and grades of cattle but not others. In an "ideal" market and within surplus production areas, prices of slaughter cattle will be below Chicago prices at points farther from the deficit production area and above Chicago prices nearer deficit production areas. In all probability Chicago prices of stockers and feeder cattle are not as representative of the national market as Kansas City or Omaha prices.

sumers generally use a much shorter period in planninng purchases than do entrepreneurs in planning and conducting production enterprises.

6. Markets *discover* the prices at which buyers and sellers make decisions to trade.[13] Decisions to trade are based on a quite different set of supply and demand estimates than are decisions to produce or consume —i.e., decisions that determine supply and demand. Hence, prices discovered by the market at any particular time were previously determined by the aggregate of the decision that producers and consumers made on the basis of anticipated prices. The price discovered in the entire market is the "ideal" price—a price that reflects supply and demand conditions within a socially acceptable institutional framework after the costs of providing time, form, and space utility are taken into account. Any market outlet that does not provide a price discovery mechanism that will enable traders to consummate transactions at the "ideal" market price is inefficient.

Evaluation of the Pricing Mechanism Provided by Three Auctions

Criteria. Within a framework of the "ideal" market the pricing mechanism provided by three Florida auctions will be evaluated on the basis of four criteria: (a) number of animals traded, (b) simple average of prices discovered for comparable animals, (c) price trends, and (d) stability of prices.

Methodology. The analysis is based on Federal-State Market News Service reports on number sold and prices paid for the several classes and grades of cattle in three Florida auctions and Chicago over a five-year period 1949 through 1953.[14]

The three Florida auctions are identified as Auctions A, B, and C. Auction A is located about 130 miles from Auctions B and C, and the distance between B and C is approximately 227 miles. The three firms are (1) privately owned and operated, (2) do not buy and sell livestock on their own account[15] and are not posted under the packers and stockyards act. The auctions are operated within a framework of state laws that define financial and sanitary standards. Each auction is located within 30 miles of

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[13] Both Geoffrey S. Shepherd and Oscar C. Stine suggest that the word "register" might be more appropriate than the word "discover."

[14] The three Florida auctions studied were selected because prices paid for cattle and calves in these markets have been reported by the Federal-State Market News Service for a longer period of time than for any other markets in the state. The Florida State Marketing Bureau and the U. S. D. A. initiated Federal-State Market News reports at Florida livestock auction sales late in 1948 after about two years' experimental work on reporting prices.

[15] These firms will, on occasion, act as a buying agent.

a packing plant having a slaughter capacity of more than 200 animals per day. The packing plants near Auctions A and C are federally inspected and the packing plant near Auction B actively trades in the national market for live animals.

Number of Cattle and Calves Sold. The average number of cattle and calves sold per day is frequently used as a measure of the size of a market outlet. By this measure the size of the three auctions studied ranged from 202 animals per sale in Auction C to 609 animals per sale at Auction A (see Table 1). Auction A was one of the larger, if not the largest, auction in the

TABLE 1. AVERAGE NUMBER OF CATTLE AND CALVES SOLD IN THREE FLORIDA AUCTIONS CONDUCTING MONDAY SALES
(September, 1948–December, 1953)

	Auction A			Auction B[1]			Auction C		
	No. Sales	Average No. Animals Sold	σ	No. Sales	Average No. Animals Sold	σ	No. Sales	Average No. Animals Sold	σ
All Cattle and Calves	264	609.14	216.47	184	346.97	113.70	255	201.74	90.34
Cattle	264	378.76	156.00	184	218.36	72.08	255	154.08	67.31
Calves	264	230.38	112.94	184	128.61	62.26	255	47.66	34.12

[1] Auction B was not reported after December, 1952.
Source: Calculated from data supplied by Florida Marketing Bureau, 505 W. Adams St., Jacksonville, Florida.

state. Although Auction C was small with respect to Auction A, it was considerably larger than about half of the auctions operating in Florida during the period studied.

Actually, the average number of animals sold per sale is a crude and unsatisfactory measure of size. Most market outlets handle all classes and grades of animals but some handle larger proportions of some classes and grades than others. Traders are well aware of this fact and are consequently interested in the number of animals of specific classes and grades of cattle and calves sold as well as prices. Market news reporters on the three auctions studied collected these data but they were not included in the published reports.

The three auctions studied were much larger market outlets for low-grade slaughter and stocker and feeder animals than high-grade animals (see Tables 2 and 3). The very low percentage of cattle grading U. S. Good and Better sold in Auctions A and C strongly suggests that the pricing mechanism for these classes and grades of cattle and calves is less than ideal.

Buyers take the small number of high-grade animals offered for sale at a market outlet into account in pricing: (a) by refusing to bid the market

Table 2. Number and Percentage of Various Grades of Three Classes of Slaughter Animals Sold in Two Florida Auctions from January 1949 Through 1953

Grade	Auction A		Auction C	
	No. of Animals	% of Total	No. of Animals	% of Total
		Slaughter Steers		
Prime[1]	—	—	—	—
Choice[2]	115	.6	68	1.1
Good[3]	355	2.0	342	5.7
Commercial[3]	1,502	8.5	1,049	17.6
Utility[4]	5,505	31.1	2,176	36.5
Cutter	7,795	44.0	1,669	27.9
Canner	2,438	13.8	670	11.2
Total	17,710	100.0	5,974	100.0
		Slaughter Heifers		
Prime[1]	—	—	—	—
Choice[2]	11	0.3	51	2.8
Good[3]	56	1.4	92	5.0
Commercial[3]	336	8.2	295	16.1
Utility[4]	1,294	31.5	710	38.6
Cutter	2,002	48.8	554	30.2
Canner	404	9.8	135	7.3
Total	4,103	100.0	1,837	100.0
		Slaughter Cows		
Commercial	197	1.4	109	2.2
Utility	1,869	12.9	981	19.6
Cutter	6,655	46.0	1,853	37.0
Canner	5,741	39.7	2,068	41.2
Total	14,462	100.0	5,011	100.0

[1] Old Choice.
[2] Old Good.
[3] Upper and lower halves of old Medium, respectively.
Estimated by assuming that the proportion of the upper and lower halves of old medium grade (new good and commercial respectively) sold from Jan., 1949 through 1950 was the same as the proportions of good and commercial sold in 1951. For example, the total number of good and commercial slaughter steers sold in 1951 in Auction A was 241, of which 57 were good and 184 commercial. Thus, 57/241, or 23.6% of the animals that would have graded medium prior to 1951 were good according to the new grades. Consequently, 23.6% of the 297 animals grading medium prior to 1951 were assumed to be of the quality that would have graded good in 1951. 23.6% of 297 animals is 70. 70 plus 57 is 127—the total number of good animals for the entire period.
[4] Old Common.
Source: Calculated from data supplied by Florida Marketing Bureau, 505 W. Adams St., Jacksonville, Florida.

price for cattle that are not offered in sufficient quantity to be transported economically,[16] and (b) by failing to attend sales at which they are not reasonably sure high-grade animals will be offered.

[16] Of course, it is true that the price the buyer does offer is the best a seller of one or two animals could obtain within the existing institutional framework. However, other institutional arrangements might facilitate the assembly of larger volumes

TABLE 3. NUMBER AND PERCENTAGE OF STOCKER STEERS OF VARIOUS GRADES SOLD IN TWO FLORIDA AUCTIONS, SEPTEMBER 1948–DECEMBER 1953

Grade	Auction A		Auction C	
	Number	% of Total	Number	% of Total
Good	65	.44	184	3.12
Medium	810	5.55	850	14.39
Common	5,066	34.68	2,202	37.29
Inferior	8,666	59.33	2,669	45.20
Total	14,607	100.00	5,905	100.00

Source: Calculated from data supplied by Florida Marketing Bureau, 505 W. Adams St., Jacksonville, Florida.

TABLE 4. PERCENTAGE OF SALE DAYS VARIOUS SIZE GROUPS OF SLAUGHTER STEERS WERE SOLD IN TWO FLORIDA AUCTIONS
(January 1, 1949–December 31, 1953)

No. of Animals Sold	Medium[1]		Good[2]		Commercial[2]		Utility (Old Common)[2]	
	No. of Days	Percent	No. of Days	Percent	No. of Days	Percent	No. of Days	Percent
				Auction A				
0	45	44.6	73	48.3	15	9.9	4	1.6
1– 5	38	37.6	61	40.4	44	29.1	35	13.9
6–10	10	9.9	14	9.3	39	25.8	51	20.2
11–15	6	5.9	3	2.0	30	19.9	40	15.9
16–20	2	2.0	—	—	13	8.6	22	8.7
21–over	—	—	—	—	10	6.7	100	39.7
Total	101	100.0	151	100.0	151	100.0	252	100.0
				Auction C				
0	25	27.8	76	52.0	22	15.1	10	4.2
1– 5	49	54.5	56	38.4	70	47.9	93	39.4
6–10	13	14.4	11	7.5	28	19.2	59	25.0
11–15	3	3.3	2	1.4	15	10.3	31	13.2
16–20	—	—	1	.7	6	4.1	8	3.4
21–over	—	—	—	—	5	3.5	35	14.8
Total	90	100.0	146	100.0	146	100.0	236	100.0

[1] (January 1, 1949 to December 31, 1950).
[2] (January 1, 1951 to December 31, 1953)—New Grade.
[3] (January 1, 1949 to December 31, 1953).
Source: Calculated from data supplied by Florida Marketing Bureau, 505 W. Adams St., Jacksonville, Florida.

Since high-grade cattle were sold at only about half of the sales conducted by Auctions A and C and since the number of animals offered for sale on the days these grades of animals were sold was small, Auctions A

of high grade animals and hence, enable sellers of one or two animals to obtain the ideal price.

and C could not discover the ideal price for high-grade cattle (see Tables 4 and 5).

Simple Average Prices

Under ideal market conditions, prices paid for U. S. Prime, U. S. Choice, U. S. Good and U. S. Commercial slaughter cattle in the 3 Florida auctions (located in deficit production areas) would be approximately equal to the prices paid for comparable animals in the major surplus producing area

TABLE 5. PERCENTAGE OF SALE DAYS VARIOUS SIZE GROUPS OF SLAUGHTER HEIFERS WERE SOLD IN TWO FLORIDA AUCTIONS (1949–1953)

No. of Animals Sold	Medium[1]		Good[2]		Commercial[2]		Utility (Old Common)[3]	
	No. of Days	Percent	No. of Days	Percent	No. of Days	Percent	No. of Days	Percent
				Auction A				
0	53	52.5	123	82.6	51	34.2	15	6.0
1– 5	47	46.5	26	17.4	89	59.7	141	56.4
6–10	1	1.0	—	—	8	5.4	65	26.0
11–15	—	—	—	—	—	—	19	7.6
16–20	—	—	—	—	1	.7	5	2.0
21–over	—	—	—	—	—	—	5	2.0
Total	101	100.0	149	100.0	149	100.0	250	100.0
				Auction C				
0	24	26.7	111	78.7	62	44.0	45	19.5
1– 5	61	67.8	30	21.3	77	54.6	151	65.4
6–10	5	5.5	—	—	2	1.4	27	11.7
11–15	—	—	—	—	—	—	5	2.2
16–20	—	—	—	—	—	—	1	.4
21–over	—	—	—	—	—	—	2	.8
Total	90	100.0	141	100.0	141	100.0	231	100.0

[1] (January 1, 1949 to December 31, 1950).
[2] (January 1, 1951 to December 31, 1953)—New Grade.
[3] (January 1, 1949 to December 31, 1953).
Source: Calculated from data supplied by Florida Marketing Bureau, 505 W. Adams St., Jacksonville, Florida.

(as measured by Chicago quotations) plus the cost of transfer. The validity of this assumption is substantiated empirically by the fact that many direct sale transactions are consummated at this figure. Freight rates, which are at best only crude under-estimate of transfer costs, suggest this difference should have been from $1.46 to $1.60 during the period studied (see Table 6). On the other hand, the average prices of U. S. Utility, U. S. Cutter, and U. S. Canner grades would have been the same in each of the three Florida auctions and Chicago if ideal conditions had prevailed at each of the four market outlets.

A qualitative evaluation of prices paid for the 3 highest grades of

TABLE 6. FREIGHT RATES ON CATTLE AND BEEF CARCASSES FROM CHICAGO TO THREE FLORIDA AUCTIONS[1]

From Chicago to:	Cattle		Beef Carcasses	
	Prior to May 2, 1952	After May 2, 1952[2]	Prior to May 2, 1952	After May 2, 1952[2]
Auction A	130	150	160	184
Auction B	139	160	176	202
Auction C	127	146	150	173

[1] Cents per hundred pounds in carload lots.
[2] I. C. C. ex-parte 175 B, 15% rate increase.
Source: T. V. A. Navigation and Transportation Branch.

slaughter cattle in the 3 auctions and Chicago supports two conclusions. In the first place, prices paid for U. S. Good and U. S. Choice grade animals in the 3 Florida auctions were substantially below the ideal price (Chicago price plus transfer cost) and as much as $5.00 per cwt. below the actual Chicago price.[17] Secondly, the number of observations was so small that the 5-year average prices are not reliable indicators of the price differentials actually existing during the period. This conclusion augments and supports the earlier conclusion that the 3 Florida auctions do not provide a satisfactory pricing mechanism for the higher grades of slaughter cattle.

Simple averages of the low of the range of prices paid for U. S. Commercial cattle indicate that conditions in the 3 Florida auctions approach the ideal in varying degrees. In Auction A, the 5-year average price for U. S. Commercial heifers approximated the ideal and was approximately figure 70 to 76 cents below the ideal for U. S. Commercial cows and steers (see Table 7). In contrast, the 5-year average price of U. S. Commercial steers in Auction C was 92 cents below Chicago or about $2.38 below the ideal average price.

Five-year average prices of U. S. Utility cattle in Auction A were from approximately the ideal prices (the Chicago price) in the case of steers and $1.32 above in the case of heifers. On the other hand, the 5-year average of prices paid for animals of the same grade in Auction C ranged from about the ideal price for heifers to $1.52 below for steers. This and other qualitative data suggest that large auctions discover prices that approximate the ideal much more closely than do small auctions.[18]

[17] This wide difference occurred only on a few scattered sale days. However, in the year 1953, U. S. Good animals were sold at Auction C at only 16 of 50 sale days and averaged $1.16 below the Chicago price or $3.62 below the ideal price.

[18] Heifer prices were higher in relation to steer prices in three Florida markets than in Chicago. This was probably due to the fact that Florida farmers were expanding their herds during much of the period and hence were bidding up the prices of female stock.

TABLE 7. FIVE-YEAR AVERAGE OF LOW OF THE RANGE OF PRICES PAID FOR SPECIFIC CLASSES AND GRADES OF SLAUGHTER CATTLE IN CHICAGO AND 3 FLORIDA AUCTIONS[1] 1949–1953

Market Center		Cows		Heifers		Steers	
		U. S. Utility	U. S. Commercial	U. S. Utility	U. S. Commercial	U. S. Utility	U. S. Commercial
Auction A Chicago	Obs.	181	43	211	128	226	168
	Av. Price	18.90	21.11	20.43	24.48	20.30	24.07
	Av. Price	17.80	20.31	19.11	22.85	20.48	23.33
	Difference between A and Chicago	1.10	.80	1.32	1.63	−.18	.74
	t^2	12.47	−1.17*	11.19	1.99*	−1.7*	−4.77
Auction B Chicago	Obs.	129	27	104	37	164	106
	Av. Price	19.08	24.29	21.58	24.79	21.43	24.56
	Av. Price	19.11	24.37	20.12	23.20	21.61	24.23
	Difference between B and Chicago	−.03	−.08	1.46	1.59	−.18	.33
	t^2	−.2*	−4.93	8.60	.53*	−1.5*	−6.58
Auction C Chicago	Obs.	166	57	185	138	223	168
	Av. Price	17.69	19.54	18.63	22.63	18.75	22.21
	Av. Price	17.66	19.10	18.69	22.36	20.27	23.13
	Difference between C and Chicago	.03	.44	−.06	.27	−1.52	−.92
	t^2	.21*	−3.86	−.56*	−7.46	−14.7	−17.30
	F[3]	50.21	13.42	65.53	19.44	69.86	98.05

[1] Based on data reported by Federal State Market News office at Thomasville, Georgia and U. S. D. A. market news office in Chicago. Paired price observations, i.e. price paid on the same day in Chicago and one market were used in constructing the averages and analysis of variance.

$$^2t_{D_i} = \frac{\overline{D_i}}{\sqrt{\frac{M \square w}{n_i}}}$$

$\overline{D_i}$ = mean of differences between the i^{th} Florida auction and Chicago.
$M \square w$ = mean square of variances within market outlets.
n_i = number of observations.

[3] Calculated on basis of analysis of variance of price differences between Chicago and each of the 3 Florida auctions.

* Non-significant at the 0.99 level. The hypothesis upon which this analysis was based is: Prices paid for comparable animals in Chicago and the 3 Florida auctions were observed in the same market after differences in transfer costs were taken into account. Since Florida is a surplus producing area for U. S. Cutter, U. S. Canner, and U. S. Utility cattle, prices in Chicago and the 3 Florida auctions should be the same if they are part of the same market. On the other hand, the price of U. S. Commercial in the 3 Florida auctions should exceed the Chicago price by at least the freight rates if the same situation prevails. Roy L. Lassiter, Jr. made the statistical analysis on the basis of the author's hypothesis.

Average prices of cutter and canner animals were not analyzed because of the lack of precise data on the separate grades.

Simple averages of prices are only indicators of the level of prices paid and should not be construed to mean that prices are always higher in the market with the higher average price. Sellers who can choose among markets will probably receive a higher price in the market that returns the highest average price. Conversely, buyers would probably be able to buy animals at lower prices in markets that have lower average prices. Auctions with average prices lower than ideal market prices are defective and contribute to the malallocation of resources of the area in which they are located and hence retard economic growth.

Price Trends

The 13-week moving average of prices in a market minimizes the effect of sale-to-sale price variation and emphasizes the seasonal and annual price trends. The extent to which prices of U. S. Utility slaughter steers

in Chicago and the three Florida auctions move together is shown in Figure 1. Under ideal market conditions the price trend in each market outlet would be the same. Hence, the extent to which the 13-week moving averages are not the same for all markets is a measure of the deviations from ideal market conditions.

The data on price trends strongly suggest that the time required for prices to adjust constitutes a defect in the market in general and in the pricing mechanism in particular. For example, all of the auctions were slow to reflect changes in the market conditions at the time of the Korean crisis, but Auction A did finally adjust to and then exceeded ideal prices for several weeks after the national market had reached a peak. Likewise, Chicago and Auction A reached and discovered the high price of the cycle almost simultaneously, but prices at Auction B peaked somewhat later. This type of market defect deserves much study in the future.

Price Stability

To the extent that daily prices discovered in any outlet fluctuate around a longer run trend in prices, the pricing mechanism is defective. Deviations of daily prices from the 13-week moving average is a measure of the

TABLE 8. VARIANCE OF ACTUAL PRICES FROM 13 WEEK MOVING AVERAGE PRICES FOR U. S. UTILITY ANIMALS (1949–1953)

Market Center	No. of Observations	$\Sigma(x^2)$[1]	Variance[2]
		Slaughter Steers	
A	235	186.8	0.79
B[4]	164	140.3	0.86
C	223	230.9	1.04
Chicago	239	108.8	0.46
		Slaughter Heifers	
A	217	207.66	0.96
B[4]	115	151.37	1.32
C	183	215.38	1.18
Chicago	240	103.69	0.43
		Slaughter Cows	
A	228	176.37	0.77
B[4]	172	74.36	0.43[3]
C	204	167.09	0.82
Chicago[5]	186	74.56	0.40

[1] Calculated from the low of the range.

[2] Variance was determined by calculating the differences (x) between actual prices paid on a given day and the 13 week moving average price for the same day, squaring these differences, summing them and dividing the sum by the number of observations.

[3] The stability of the slaughter cow prices in Market Center B is largely explained by the fact that it is a major trading center for milk cows—the sale of which exceeds the sale of beef cattle at times.

[4] Market B not reported in 1953.

[5] Chicago not reported in 1949.

magnitude of these defects (see Table 8). These variances suggest that large markets may discover more stable prices than small auctions.

Summary and Conclusions

The requisites chosen for an "ideal market" for cattle and calves are based on society's insistence on efficient production and the ideology that competition will achieve such efficiency. The concept serves a 2-fold purpose:

1. The ideal market constitutes a hypothesis that can be rigorously examined and tested. If the validity of the hypothesis can be demonstrated, or a more valid hypothesis synthesized, it will provide a basis for developing a theory of cattle marketing that would be useful in evaluating proposed changes in the livestock marketing system. Such a theory would have many points in common with the theory of marketing other commodities, but at the same time be realistic for cattle and beef products' market.

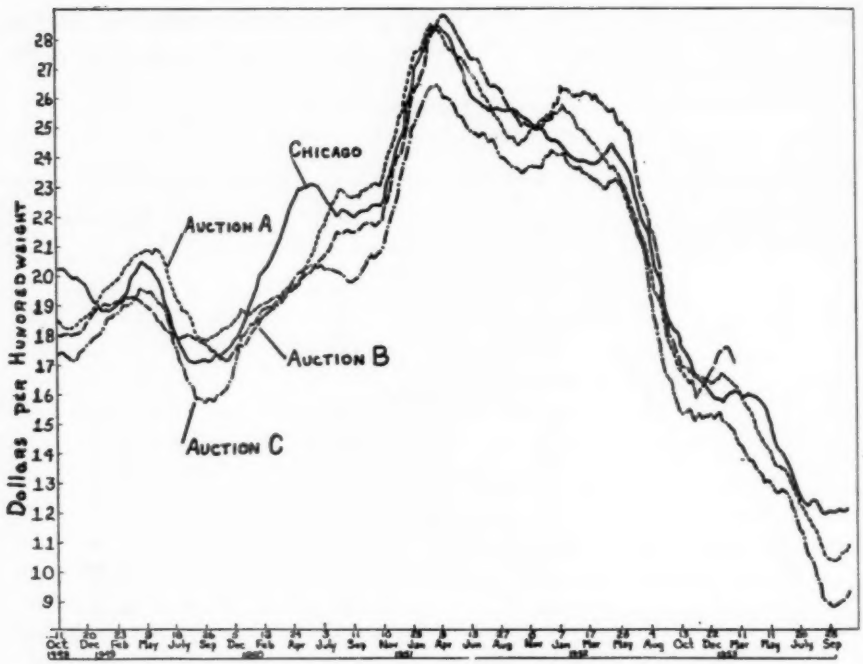

Fig. 1. Thirteen-Week Moving Average of Low of Range of Prices Paid for U. S. Utility Grade Slaughter Steers in Chicago and 3 Florida Auctions—September 1948 through 1953.

Source: Calculated from data published in Florida area weekly livestock market news Summary, U.S.D.A., Thomasville, Georgia.

2. The requisites of the ideal market provide criteria for evaluating the price discovery mechanism provided by 3 Florida market centers. This evaluation identifies defects in the pricing mechanism provided by the three auctions and suggests the following tentative conclusions:

(a) None of the auctions provided a satisfactory pricing mechanism for the 4 higher grades of cattle, especially U. S. Good and better, principally because the supply of cattle and calves of these grades offered was small and unpredictable.

(b) In most instances the prices paid for comparable animals of the lower grades varied more among prices paid in Florida auctions than among prices paid in Auction A and the ideal price—as indicated by the Chicago price.

(c) The results indicate (but do not prove conclusive) that large auctions provide a more accurate price discovery mechanism than small auctions.

These results have at least three implications for agricultural policy. The inability of auctions to discover the true market price of high-grade cattle may be retarding the development of the beef industry in the Southeast. The large number of small auctions in the region may be depressing the price of all cattle below the price that could be obtained in larger and more efficient auctions. Finally, it may be possible to obtain a more efficient allocation of resources in an area by deliberately creating more ideal market conditions.

ON CONSUMER GRADES FOR FOODS

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Introduction

GRADING has been promoted as a means of classifying various agricultural products in the market. Much of the promotional effort originated primarily from producers and traders because these groups hoped to gain by grading. The chief argument for grading has been that units of a given product of heterogeneous values are classified into groups of more uniform value. The advantages of such a classification for the facilitation of trading have often been enumerated. The protection afforded buyers by grading has been emphasized when it was thought likely that unaided they lacked the requisite skills for determining value. On the other hand, buyer ignorance obviously also affords opportunities for using the grades for the benefit of the sellers rather than the buyers. Economists have considered grading as essential in facilitating competition in the markets. But evaluations as to the efficacy and the specific criteria of grade standards have varied. The generally accepted basis for grading is that grades must be meaningful to consumers and must provide an efficient means for consumers to communicate their preferences through trade channels to producers. One of the major problems in establishing a grading standard based on consumer preferences has been lack of information in this area.

Research has been underway for some time at the Missouri Agricultural Experiment Station concerning the consumer acceptability of various grades of beef and consumers' preferences among these grades in various substitution situations. A prerequisite for the guidance and interpretation of empirical work on problems of acceptance and preference was the development of an analytical framework for the evaluation of beef grades. This paper presents the framework that has been developed. Empirical work in this area involves the modification of certain research techniques adapted from other fields. Since both the analytical framework and the techniques are believed to have relevance—in modified form, probably—to some other foods besides beef, these techniques are briefly explained and an introduction is given to the literature concerning them. It should

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be emphasized that this paper is in the nature of a progress report. Many hypotheses remain to be tested.

Criteria of an Optimum Grading System

Almost all beef is purchased by consumers in the retail cut. Beef is generally graded in the carcass or in large wholesale cuts. Since various retail cuts are known to vary considerably as to tenderness and fat content, grading of wholesale cuts or carcasses may not be suitably applicable for the smaller cuts.[1] Preferences in relation to grades need to be studied for individual retail cuts in order to determine the degree of carcass breakdown at which grading can be most meaningful. The following discussion speaks of "beef" and is interpreted to mean any particular retail cut. If empirical research shows the feasibility of considering all cuts of the carcass together for grading purposes, then that interpretation may be placed upon the term "beef." These considerations do not preclude carcass grades for the benefit of intermediate buyers. Only grading for the consumer is considered here.

An optimum grading system should (1) be workable in the marketplace and (2) be oriented at the retail level to the preference of consumers. The workability of a grading system depends upon its acceptance by the market interests concerned with its use. Such acceptance may be partly a function of factors other than the feasibility and efficiency with which grading can be done. Due recognition must be given to the importance of grading criteria that are easily understood and applied, however, and to criteria subject to little variation in interpretation by the various parties concerned. The argument is persuasive that the more objective the grading criteria are the more workable is the grading system, though subjective terminology have often been used and may continue to be used.

Criteria for consumer grades should be oriented to consumer preferences. An optimum grading system should classify as alike or as "in a grade" all those products consumers value the same. Those products consumers value differently should be in different grades. For a grade to be of maximum usefulness, *almost all* consumers must consider the units within a grade as homogeneous price-wise. On the other hand, grades may be very useful even if only a small proportion of consumers value the units differently within more than one grade—provided that these consumers purchase a considerable amount of these grades. From the

[1] D. E. Brady, "A Study of the Factors Influencing Tenderness and Texture of Beef," *American Society of Animal Production Proceedings*, 30, pp. 246-50; J. Ramsbottom *et al.*, "Comparative Tenderness of Representative Beef Muscles," *Food Research*, 10:497-509.

point of view of maximizing producer profits, this small proportion of consumers could still justify grading. From the point of view of maximizing consumer satisfaction, this proportion might need to be fairly large. To give concreteness to this discussion, it is assumed that if one-fourth or more of the relevant consumer population values any two units of a retail cut of beef differently by as much as five cents or more per pound the cuts should be in different grades. If more than one-fourth of the relevant population values any two beef units differently by less than five cents per pound, or if less than one-fourth values them differently by more than five cents per pound, the two cuts are assumed to be so alike as to justify being included in the same grade. It is not easy to demonstrate which specific combinations of proportions of consumers and value differentials among units of a product would be required to justify a consumer grading system from either the private or social point of view. The relative advantages and costs of marketing several grades together influence the optimum width of the grades.

The possibilities of altering grade boundaries to adjust for seasonal or other changes in supplies would appear to incur less danger of reducing consumer satisfaction—and thereby consumer confidence in grades—in the case of grades based on obvious product characteristics than in the case of grades based on hidden product characteristics. For example, seasonal adjustments in the sizing or even grading of potatoes probably would not hinder the usefulness of the sizing and grading to consumers.[2] However, alterations in grades that produced unexpected changes in eating qualities at the dinner table would probably weaken confidence in the grading system and reduce its usefulness.

We specify that a certain proportion of consumers must value the two products differently. This is not the same as specifying that the market or the equilibrium prices of the two products are different. The relative equilibrium prices of various grades depend on relative demand and supply conditions. Two grades might sell at the same price in the same market at any given time, as will be shown later.

Consumers may value these two beef products differently because of visual, sensory, or imaginary differences. Only "real" differences—visual or sensory—are assumed to be of interest as a basis for public grades. If grading is undertaken, grading criteria based on real preferences of consumers are a necessary condition for efficient resource allocation and the maximization of consumer welfare. Very possibly a "grade" that is homogeneous visually is heterogeneous in eating satisfaction and vice

[2] Cf. Sizing recommendations in *Consumer Acceptance of and Preference for Potatoes*, North Central Regional Publication No. 24, North Dakota Bulletin 374, 1952.

versa. If sensory differences are the main cause for differences in consumer valuation of beef, this does not preclude the appraisal by the consumer or customer of visual characteristics as indicators of sensory characteristics.[8]

There are two important questions in setting up a grading system for a food product. (1) How many grades should there be and where should the boundaries be? (2) What should be the grade names? Should they be rank-ordered or not? The economist is also interested in estimating the price relationships among grades that will maximize the efficiency of allocating resources in relation to consumers' preferences. Answers to these questions cannot be given without knowledge of both consumer preferences and production possibilities.

Analytical Framework

To provide a framework for analysis of grading of individual foods, various assumptions must be made about the nature of consumers' preferences. Analysis of preference problems can be handled graphically by what is called a "given-product" diagram. Indifference and transformation maps are drawn with amounts of two given products or grades shown on the axes. The problem is to determine the outputs and prices of the two grades that will give efficient resource allocation. Theoretically, more grades can be handled by adding more axes. However, this analysis should be preceded with an analysis of consumer preferences to define the particular grades taken as given in the "given-product" diagram.

The writers have experimented with a "product-composition" diagram, which is an adaptation of common supply analysis to those products having two or more principal elements being complementary substitutes within a considerable range, such as lean muscle and fat in the case of beef. Fat and nonfat solids are somewhat comparable elements in milk. Figure 1 is an example of a product-composition diagram for beef. The indifference curve I shows the attitudes of a consumer (or group of consumers with identical preferences) toward various proportions of fat and lean in the beef product. These proportions and attitudes pertain to the joint consumer product and not to separable fat and lean products. Amounts of fat or lean as measured along the axes have significance only as showing the particular proportions of fat and lean in the beef product. The transformation curve T shows the cost relations among various "types" of beef at a given level of expenditures. The tangency of the

[8] The distinction between "visual" and "sensory" differences is often made in the literature of this field, although this is somewhat unfortunate semantically. "Sensory" and "eating" differences are used interchangeably in this paper.

indifference and transformation curves shows the preferred type or types of beef to be produced under given preference and cost conditions. However, this tangency position does not show the desired output of the preferred type or types. Once the type or types are defined, the given-product diagram may be used in the analysis of output. The product-composition diagram is not indispensable in relating grades to preferences but it does add useful amplification for defining the grade boundaries.

The use of fat-lean ratios as criteria for grading beef should cause no

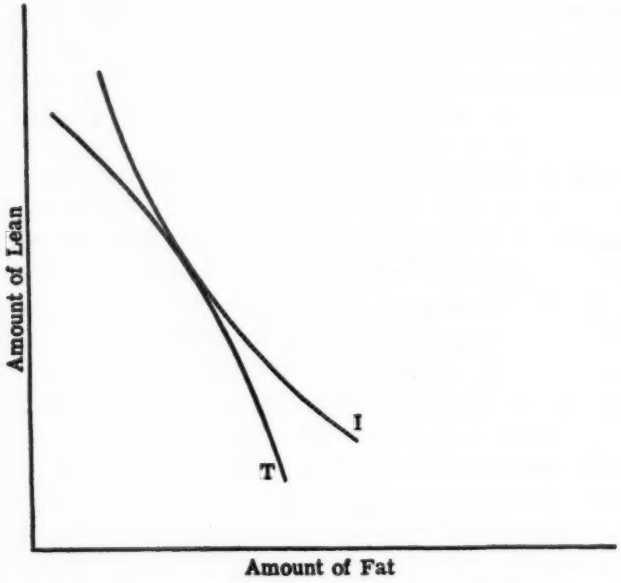

FIG. 1. PRODUCT-COMPOSITION INDIFFERENCE DIAGRAM.

surprise since present federal and packer grades are rather highly related to such ratios. Quite obviously, beef may be differentiated by other criteria such as physical or chemical characteristics, or other measurements, if these are found to be related reliably to relevant organoleptic characteristics.

Hypothetical Preference and Production Situations

A number of hypothetical cases can be developed to demonstrate the assumptions implicit in various generalizations concerning consumer grades. In some cases rather stringent assumptions are necessary in order to be consistent with the generalizations. Six different sets of assumptions concerning preferences and production possibilities are specified in the

cases below. These mutually exclusive cases cover a wide range of possibilities some of which may be relevant to beef. The conditions of one case may be found to be realistic for one beef cut while another case may be more relevant for another beef cut. Assumptions underlying one or more of the various cases may also be relevant for other foods.

Case I. Universal Indifference (No preferences). Consumers have no preference among various "types" of beef (particular combinations of fat and lean) at equal quantitative rates of substitution. All consumers could

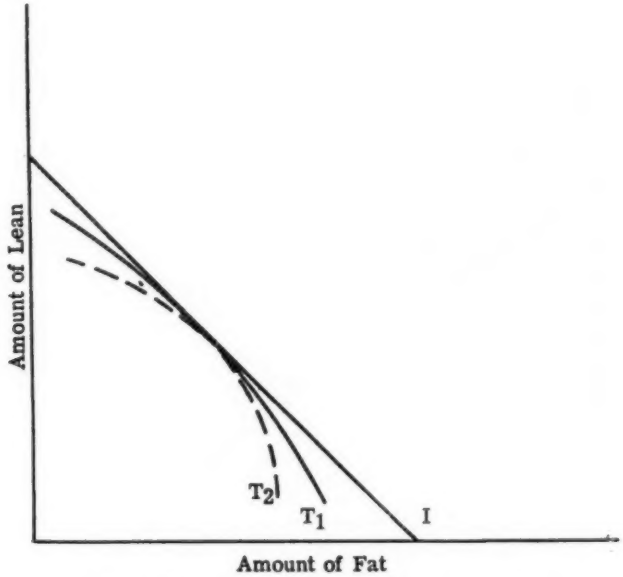

FIG. 2. UNIVERSAL NO PREFERENCES CONCERNING COMPOSITION OF PRODUCT.

be represented by a straight-line indifference curve of the slope minus one as is shown in the product-composition diagram of Figure 2. The optimum type of beef is the proportion of fat to lean at which the indifference curve is tangent to the transformation curve and the consumer satisfaction for a given outlay is maximized when the marginal rate of resource substitution equals the marginal rate of product substitution. In this case of universal no proference at equal quantitative substitution rates, the optimum type of beef is that which maximizes the quantity of beef produced by a given amount of inputs.

As shown in Figure 2, only one type of beef should be produced if the tangency is a point. On the other hand, if tangency coincides over a considerable range (as with T_1), should these physically dissimilar

combinations be separated into various "grades"? No, because consumers have been assumed to be indifferent among these varying product combinations. This indifference may be due to an inability of consumers to discriminate among the eating characteristics of the various types or impartiality toward eating differences detected. The economic usefulness of grades depends upon their indication to some consumers of differences in value. Organoleptic differences (differences in eating satisfaction) are a necessary but not a sufficient basis for value differences.[4]

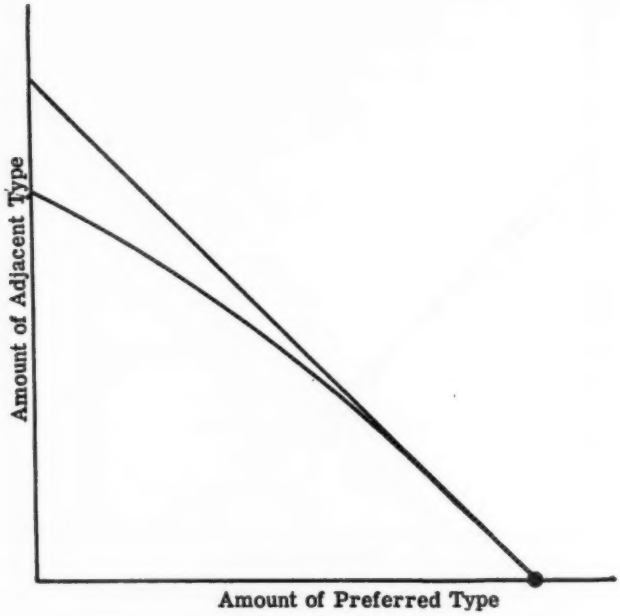

FIG. 3. A CASE OF NO PREFERENCES SHOWING THE OPTIMUM RELATIVE OUTPUTS OF TWO TYPES OF BEEF.

The first requirement for grading is a consumer unwillingness to exchange some units of a product for other units at an equal substitutionary rate. Prerequisite to such unwillingness is consumer ability to detect eating differences in the units. This ability doubtlessly varies with consumers and with the products concerned.[5]

Even though grading is not justified at the consumer level, there is still

[4] Differences in appearance alone are ignored to simplify the presentation at this point.

[5] Kathryn E. Langwill, "Taste Perception and Taste Preferences of the Consumer," *Food Technology*, 3:136-39. Wilbur Gould *et al.*, "Flavor Evaluations of Canned Fruits and Vegetables Treated with Newer Organic Insecticides," *Food Technology*, 5:129-33.

a specific type or types (i.e. particular combinations of fat/lean) of beef –depending upon the number of tangencies of indifference and transformation curves–that should be produced to obtain efficient allocation of resources.

These points may be illustrated on the more familiar given-product diagram. Figure 3 shows the indifference and transformation relations between the economically optimum (the preferred) type of beef, and another type (say the type adjacent to the optimum), assuming only one point of tangency. Figure 4 shows the indifference and transformation

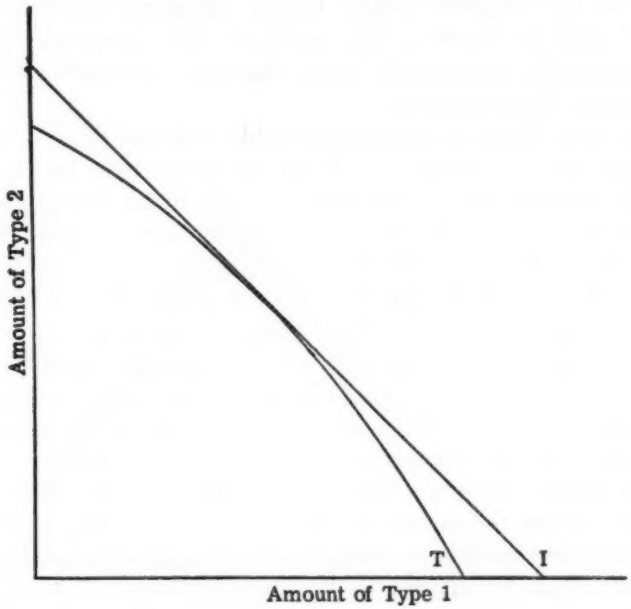

FIG. 4. A NO PREFERENCES CASE SHOWING THE OPTIMUM RELATIVE OUTPUTS OF TWO TYPES OF BEEF.

relations between two distinct and optimum types. The tangency point in Figure 4 shows the relative outputs of two types of beef most economically produced when all consumers are indifferent among the various types of beef. The two types should not be separated into grades.

Case II. Identical Preferences (Point Tangency). The assumptions in this case are that all consumers have an identical preference map concerning beef and that tangency is a point rather than a range. Various shapes of transformation curves may be assumed consistent with the above conditions. The indifference curves may vary from an L-shape to a nearly straight line of slope minus one. Under these assumptions only one type of beef should be produced. That type of beef of a given fat/

lean ratio is indicated by the slope of a straight line from the origin through the tangency point. Grading is not needed in this situation because only one type of beef can be produced economically. This type is the preferred type at the prevailing price relationships among types of beef.

Case III. Identical Preferences (Tangency Range). All consumers have the same indifference map and there is a range of tangency.[6] The slope of the curves within the range of tangency could possibly be minus one —indicating consumer indifference among the various types of beef included in the tangency range. In this situation, there would be no economic gain in dividing the products into consumer grades—corresponding to the organoleptic types—since all consumers are indifferent among them at the same price.

On the other hand, it is more probable that the slope of the curves within the range of tangency will not be minus one. In this situation, consumers consider almost all types of beef to be acceptable at some price. However, at equal prices certain "qualities" (types) of beef are preferred over others and this preference continues until the less favored types are priced more cheaply than the more favored types. What system of grading may be economically justifiable? As a first approximation, there should be as many grades as there are organoleptically discernible types. As already stated, the grade boundaries should be narrow enough that consumers consider the units within a grade to be alike in value. Thus, organoleptic homogeneity sets the narrowest limits for the boundaries of a grade. However, these boundaries may be wider whenever small organoleptic differences are regarded indifferently by consumers. That is, the grade boundaries can be wide enough to include some organoleptic heterogeneity as long as the included units of product remain homogeneous *in value* to consumers. There should be enough grades to include the total economic output.[7]

Quality-ordering names, such as Best, Better, and Good, or No. 1, No. 2, and No. 3, would probably be justified in this situation *since all consumers have identical preferences.* Moreover, the equilibrium prices of the various grades would be perfectly correlated with their relative

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[6] For empirical convenience, range of tangency is defined as a distance sufficiently great to obtain organoleptic discrimination between the end points by a significant proportion, or all, consumers.

[7] In a market situation in which preferences are very similar but not identical, the criterion of *most* consumers would probably be more practicable. A small proportion of extremely discriminating consumers may justify the use of special subgrades in certain markets or for certain buyers. Cf. discussion of R. L. D. Morse, *Egg Grading and Consumers' Preferences with Special Reference to Iowa Egg Marketing,* Ph.D. Thesis, Iowa State, 1942.

desirability and the "spectacle" of No. 3 grade selling higher than No. 1 grade would not be witnessed. The use of grade names may themselves subjectively affect preferences and increase the popularity of the top grade or grades. Opportunities for other social effects on preferences exist with quality ordered grade names.

Figure 5 gives the product-composition illustration for this case. Two discriminable types of beef—A and B—are assumed to be contained within the range of tangency. All consumers are indifferent between types A and

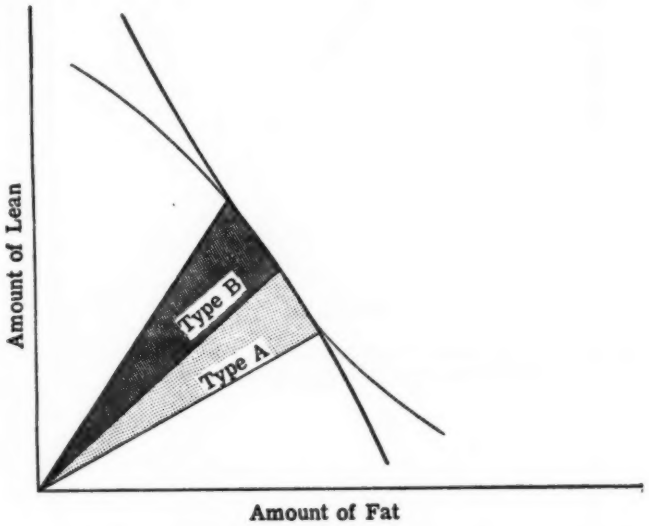

FIG. 5. IDENTICAL PREFERENCES WITH A RANGE OF TANGENCY SHOWING THE TWO PREFERRED GRADES OF BEEF.

B beef whenever the price of A is higher than the price of B by a certain proportion. Under these conditions, two grades—A and B—of beef can be economically produced.

The given-product diagram (Figure 6) as derived directly from Figure 5 shows a straight-line indifference curve I_1 between grades A and B. The transformation curve shows the relative outputs the market price ratio will bring forth. Assume the preferences of all consumers are not rigidly fixed but are influenced by the uses for which grades A and B are employed. For example, grade A beef may be preferred for serving to dinner guests while grade B is served at other times. Thus, the indifference curve in Figure 5 is not fixed, and the indifference curve I_2 in Figure 6 has some curvature. If grade A is still considered as good or better in every use than grade B, then the use of quality-ordering names would be

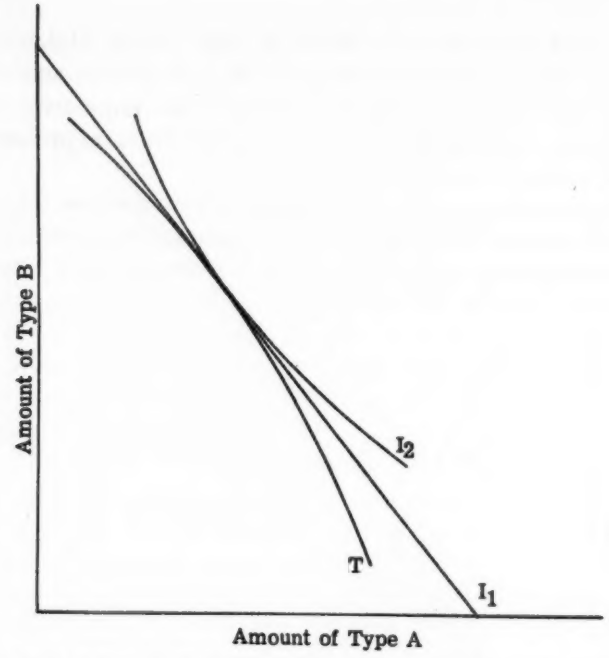

FIG. 6. AN IDENTICAL PREFERENCES CASE SHOWING THE OPTIMUM RELATIVE OUTPUTS OF TWO GRADES OF BEEF.

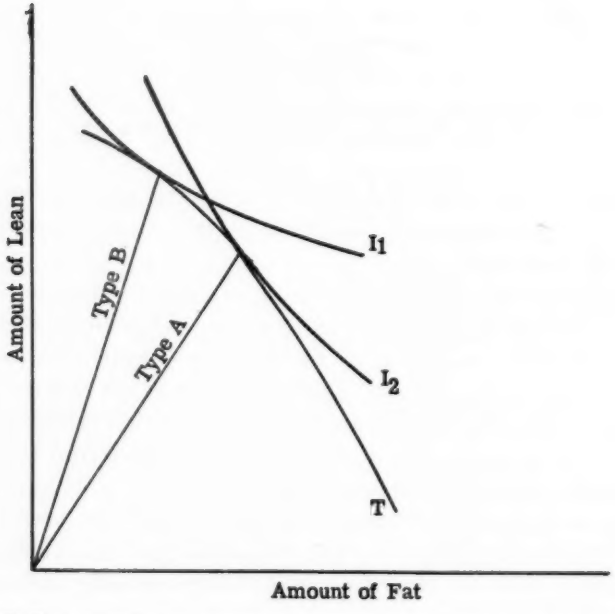

FIG. 7. TWO GROUPS OF PREFERENCES FOR BEEF ACCORDING TO ITS USE.

justified. The long-run price relationships would still place A higher than B because of its higher long-run cost relationship within the range of tangency.

Another situation in which purpose or use at different times influences preference is within the framework of Figure 7. Preferences are such that a small premium will be paid for type A beef over type B for a certain use. Conversely, type B beef will obtain a small premium for the other use. Two grades are justified. Other types are acceptable only at consider-

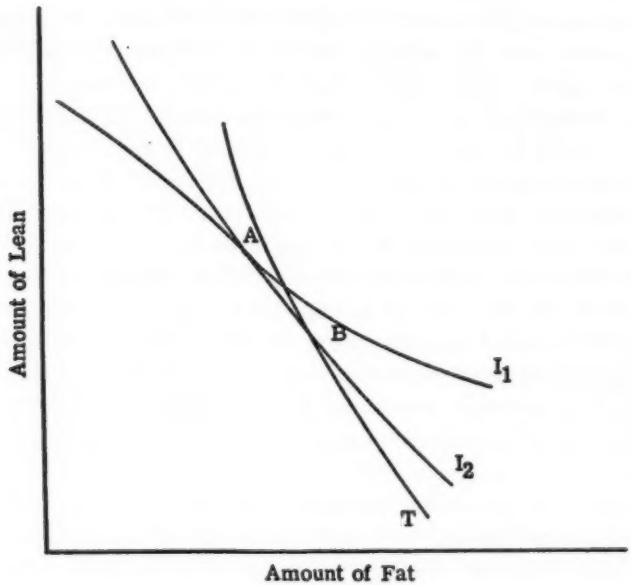

FIG. 8. BIMODAL DISTRIBUTION OF PREFERENCES.

able discounts. The equilibrium prices of the two grades might be equal, and would be within the range of the premiums offered. Price equality of the two grades would not necessarily affect their usefulness.

The use of rank-ordering grade names in this latter case would be confusing since the superiority or inferiority of the grade is related to its use. Thus, the assumption that all consumers' preferences are identical will be found to be a necessary but not a sufficient condition for the justification of rank-ordered grade names. Recognition of the complex implications that derive from the simplified assumption of identical consumers' preferences should warn the empirical investigator of the complicated nature of the consumer preference problem.

Case IV. Bimodal Distribution of Preferences (Point Tangencies). Preferences of all consumers are not identical but two indifference maps

represent them very well. These indifference curves are each tangent to the relevant transformation curve at a point and at these points the type of products are organoleptically different. These conditions are represented in Figure 8. The two consumer groups are represented by indifference curves I_1 and I_2. The tangency points are A and B. In this situation, two grades are needed for beef. Each grade is preferred by a certain group of consumers unless the other grade is priced sufficiently lower. If only a small price differential reverses preferences then grading may not be economically justifiable. Relative optimum outputs and prices would depend on the resource substitution relations between the two product grades and the relative demands for them. Under the simple assumptions above, both grades might be priced the same.

Various strength of preference situations can be assumed. On the one extreme, it might be assumed that the nonpreferred grade is completely unacceptable to that consumer group. On the other limiting extreme, it might be assumed that the preferences at equal prices are of a "two-cent variety" and that whenever either grade is available for two cents (or more) per unit cheaper than the other grade all consumers will prefer the cheaper grade. In this case, it is impossible for more than one grade to be sold in that market if amounts of one grade sufficient to meet demand can be supplied at more than two cents a pound cheaper than the other grade. Grading probably would not be justifiable with such weak preferences. There is obviously a considerable middle ground between these extremes.

Quality-ordering grade names would apparently *not* be justified in this situation. It is misleading to state that the grade preferred by one consumer group is superior to the grade preferred by the other group. Even if the equilibrium price of one grade exceeds that of the other grade, the assignment of quality-ordering grade names would disregard the preferences of a significant group of consumers.

Case V. Bimodal Distribution of Preferences (Tangency Ranges). Consumer preferences are grouped into two preference maps as in Case IV. Each indifference curve has a range of tangency with the relevant transformation curve. These tangency ranges may overlap. (Graphically, this would be a combination of Figures 5 and 7.) If organoleptic differences —both intergroup and intragroup—are not valued sufficiently different by consumers, then grading is not needed and preferences are best satisfied by selling beef in undifferentiated form. If there is a significant intergroup economic differences but no intragroup differences, then two grades are justified since there are two groups of preferences. Relative prices and volumes of sales will depend upon relative demand and supply

and are not indicators of relative "quality." The same argument against quality-ordering grade names applies as in the previous case. If there are both intragroup and intergroup economic differences then more than two grades are justified. Considerations concerning grading are the same as above.

Case VI. Multimodal Distribution of Preferences. The assumptions may be extended to more than two differing groups of preferences without affecting the principles already stated. The use of fat/lean ratio as the criterion for grading beef is purely illustrative. There is a lack of evidence that units of a cut with the same fat/lean ratio are uniform in tenderness or flavor or juiciness, or that units with varying fat/lean ratios vary systematically as to these eating characteristics.[8] Other criteria may more effectively differentiate beef as to eating characterisics but these criteria would probably supplement rather than replace the fat/lean ratio.

The possibility of the dual influence of both sensory and visual product characteristics upon consumer preferences must be recognized. Preference based upon visual characteristics may sometimes be based upon incorrect beliefs concerning the association of visual and sensory characteristics. Grading probably should not recognize such irrational beliefs. Buyer education, if feasible, is a better treatment of such beliefs. Preferences based upon aesthetic values may need to be recognized in grading. Thus, a grade that is homogeneous organoleptically may have to be subdivided to obtain homogeneity in appearance also. The same conditions concerning significant economic differences apply in establishing such grade boundaries. Criteria for an optimum grade standard have been proposed with the statement that "the terminology used should convey some concept to the individual of the relative value of the grades."[9] Such a statement about relative value is inaccurate unless the preferences of all consumers are identical and constant among uses. Neutral grade names may be difficult to obtain and more difficult to maintain, but efforts should be in that direction rather than the converse for some foods including beef. The whole concept of "relative *quality*"

[8] S. A. Husaini, F. E. Deatherage, and L. E. Kunkle, "Studies on Meat: II. Observations on Relation of Biochemical Factors to Changes in Tenderness," *Food Technology,* 4:366-69; J. J. Wanderstock and J. I. Miller, "Quality and Palatability of Beef as Affected by Method of Feeding and Carcass Grade," *Food Research,* 13:291-303; R. L. Hiner and O. G. Hankins, "The Tenderness of Beef in Relation to Different Muscles and Age of the Animal," *Journal of Animal Science,* 8:613 (abstract); A. M. Gaddis, O. G. Hankins and R. L. Hiner, "Relationships between the Amount and Composition of Press Fluid, Palatability, and Other Factors of Meat," *Food Technology,* 4:498-503.

[9] E. S. Clifton and Geoffrey Shepherd, *Objective Grade Specifications for Slaughter Steer Carcasses,* Iowa Research Bul. 402, 1953, p. 544.

becomes ambiguous as soon as it is admitted that consumers' preferences may differ.

Available evidence on preferences among beef grades strongly suggests that consumers' preferences do differ. One probable cause of differing consumer preferences is physiological differences among individuals in sensory thresholds.[10] Custom and habit are probably important causes of consumer likes and dislikes. Nor should the economist overlook the powerful economic influences of income and prices that help to shape preferences in the market place.

Empirical Methodology

The task of obtaining observations to determine which of the analytical models describes the real consumer preference situation is fraught with the usual difficulties of empirical measurement. Techniques and measures of sensory discrimination and preferences adapted from other fields appear most promising. Measures of eating preferences need to be obtained because eating satisfactions are undoubtedly the ultimate preference criteria in beef consumption and the following development of empirical methodology is mainly concerned with eating preferences.

The empirical task of setting up grades by sensory preference tests is in two steps as follows: (1) Determine a set of grades in which each grade is as inclusive as possible without including any beef units that can be discriminated among by a significant proportion (say one-fourth or more) of consumers. (2) Reduce the resulting number of grades by combining or broadening grades insofar as this does not include any beef units within a grade that are valued differently (say, five cents a pound or more) by a significant proportion of consumers.

The process of separating the total population of (block) beef into grades or groups for testing in step one should preferably be by those objective and subjective physical criteria readily used in commercial practice. If the present federal grades prove unsatisfactory, then a search should be made for other criteria. Carcass length and weight, age of animals, feeding practices, and breeding have been suggested. At present, there is insufficient evidence to indicate whether or not these grading criteria might be more satisfactory than the federal grades.

There appears to be no published research concerning consumers' eating preferences or discrimination among grades of beef. Although a considerable literature is available concerning discrimination tests on various foods, including meats, in the laboratory, there have been few attempts to extend these to large consumer samples. Approximate indi-

[10] Cf. footnote 5.

cations of consumer discrimination can be inferred from small laboratory panels,[11] but of course the final testing of the grade system should be with large consumer samples.

Various experimental designs and methods of analysis have been used in laboratory discrimination tests.[12] Sensory discrimination tests may be illustrated simply by a description of the triangle or trio test. Three samples of a food are tasted by each judge. Two of these samples are alike while the third is presumably different. Judges are asked to identify the different sample. Controls are used to eliminate visual differences, differences in cooking or temperature from test to test, and so forth. The degree to which the proportion of successes in a series of replicates exceeds chance is a measure of the degree of discriminable sensory differences. The paired comparison method involves an expression of preference or an evaluation of degree of difference (e.g., A is more tender than B) between two products at a time. Various pairs of several products or grades may be compared two at a time. The analysis estimates degree of discrimination on the basis of the consistency of responses.[13] Other methods include the rating or ranking of products by preferences or by some evaluation scale. Analysis of variance and other methods of analysis are then used to determine whether the various products were scored or ranked significantly different. Various designs such as incomplete blocks can be used to facilitate comparison of several groups or "grades."[14] Both the trio and the pair techniques have been used quite generally.

The "single-stimulus" method of obtaining consumer ratings of only one sample at any one time has been used less frequently. This test is more like home consumption than the "comparative-judgments" method and may provide more realistic results as far as preference and acceptance

[11] Organoleptic discrimination is believed to be a much less variable factor among individuals than preferences. Therefore, discrimination ability may be inferred more readily than preferences from small-panel tests.

[12] The interested reader should consult the extensive literature on laboratory panel methodology. General references are: Elsie Dawson and Betsy Harris, *Sensory Methods for Measuring Differences in Food Quality*, U.S.D.A. Agr. Inform. Bul. No. 34, pp. 1-134; David Peryam, Francis Pilgrim and Marvin Peterson, editors, *Food Acceptance Testing Methodology*, Symposium Sponsored by Quartermaster Food and Container Institute (Chicago: National Academy of Sciences—National Research Council, 1954); M. M. Boggs and H. L. Hanson, "Analysis of Foods by Sensory Difference Tests," *Advances in Food Research*, E. M. Mrak and George F. Stewart, editors (New York: Academic Press, 1949), II, 219-58.

[13] Cf. M. E. Terry, R. A. Bradley, and L. L. Davis, "New Designs and Techniques for Organoleptic Testing," *Food Technology*, 6:250, 1952.

[14] R. A. Bradley and P. N. Somerville, "Statistical Techniques for Sensory Testing of Processed Foods," Progress Report No. 1, Virginia Polytechnic Institute, February, 1955; David Mason and E. James Koch, "Some Problems in the Design and Statistical Analysis of Taste Tests," *Biometrics*, 9:39-46, 1953.

results are concerned.[15] The casual approach of the single-stimulus method would obtain less discrimination than the trio or paired comparison tests, which force the consumers to attempt to discriminate. Therefore, the latter methods probably overestimate the proportion of consumers who would notice differences among products under conditions of normal consumption. Experience is being gained rapidly with the tests described. All have been generally satisfactory although various modifications are being suggested for more accurate measurement.[16] Price differences between grades have been measured by sales tests or in combination with the discrimination-test interviews.[17]

Intragrade homogeneity and intergrade heterogeneity in *value* to consumer buyers was set as the standard for determining the grading system. In the present stage of economic research methods, the writers believe that discrimination testing is essential. Consumer preferences for commodities like beef must be based on eating experience. The writers have provided a small panel of consumers with a pair of steaks and have asked which steak was preferred and how much more per pound would be paid for it. It is not uncommon for that "preference" to be reversed when consumers later receive a duplicate pair of steaks. Consumers easily imagine eating differences but real sensory differences large enough to be detected consistently are prerequisite to any meaningful interpretation of consumer eating "preferences." Not only does the discrimination testing increase the confidence of the researcher in his final results but also such testing should increase the credibility of those results among those most directly concerned with grading.

How much consumer knowledge of grades is necessary for grading to be useful? A St. Louis study found that only 20 percent of respondents recalled correctly the names of one or more federal grades of beef without giving any erroneous names. About 26 percent of the respondents

[15] R. L. D. Morse, "Consumer Preferences for Canned Orange Juices of 12 to 22 Brix-Acid Ratios," *Proceedings of the Florida State Horticultural Society*, LXVII, pp. 186-92, 1954; D. R. Peryam and N. F. Girardot, "Advanced Taste-Test Method," *Food Engineering*, 24 (7), 58, 1952; James A. Bayton and Hugh P. Bell, *Preferences for Canned Orange Juices That Vary in Brix-Acid Ratio*, Marketing Research Report No. 76, Washington, 1954. The latter authors also discuss the difficulties of inferring discrimination from acceptability scores.

[16] N. T. Gridgeman, "Taste Comparisons: Two Samples or Three?" *Food Technology*, 9:148-50; Terry, Bradley and Davis, *op. cit.*; C. I. Bliss, M. L. Greenwood, and M. H. McKenrick, "A Comparison of Scoring Methods for Taste Test with Mealiness of Potatoes," *Food Technology*, 7:491-95.

[17] Cf. George Garnatz, "Consumer Acceptance Testing at the Kroger Food Foundation," *Proceedings of the Fourth Research Conference* (Chicago: American Meat Institute, 1952) pp. 67-72; R. L. D. Morse, "Rationale for Studies of Consumer Food Preferences," *Advances in Food Research*, E. M. Mrak and George F. Stewart, editors, (New York: Academic Press, 1951), III, pp. 386-430; John Nair, "Mass Taste Panels," *Food Technology*, 3:131-36.

named Choice and 14 percent named Commercial.[18] Consumers have too many other things to do for most of them to take time to acquire much knowledge about any given good. However, a complete lack of knowledge of almost all consumers about an existing system of differentiating a certain class of consumer products raises doubts as to the usefulness of that system. After a trial period of reasonable length, any new system of grading developed on the basis of the tests proposed here must ultimately face this test of "consumer acceptance."

Summary

In an ideal grading system all units within a grade should have the same value for any given consumer and units in different grades should have different values; and this condition should be true for most consumers though not necessarily for all consumers. An important (and relatively untried) empirical method of aiding in the research determination of value similarities and disimilarities is the sensory-discrimination test. Some important questions in establishing a grading system are as follows: (1) What should be the grade boundaries and how many grades should there be? (2) Should the grade names be rank-ordering? (3) What are the optimum price relationships among grades, given consumer preferences and the production possibilities? No position has been taken on the welfare implications of grading for various elements in the economy except to state that the basing of value differences upon real differences from the consumer viewpoint in the eating characteristics of a food is surely one essential condition for a grading system to promote efficient satisfaction of consumer preferences.

[18] V. James Rhodes, Elmer R. Kiehl, and D. E. Brady, *Visual Preferences for Grades of Retail Beef Cuts: A Study Conducted in Metropolitan St. Louis, 1954*, Missouri Research Bulletin No. 583, 1955.

ECONOMIC RESULTS OF SUBSCALDING TECHNIQUES IN THE MARKETING OF TURKEYS

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AN OPPORTUNITY to employ economic engineering analyses in the field of marketing research was presented recently with the development of the subscalding technique of processing poultry. The use of higher water temperatures (138-140° F.), as opposed to semiscalding (maximum 130° F.) permits processors to dispense with the bulk of the supplementary hand picking and finishing labor, and still present a product to the public that is free of pin feathers. Subscalding, formerly avoided because of consumer resistance to the brown appearance that results when subscalded birds are exposed to the air, has been facilitated by the development of durable transparent plastic wraps that shrink to fit the carcass and withstand the passage of moisture vapor. Quick freezing of subscalded ready-to-cook poultry so enclosed gives a neat bright finish of great consumer appeal. Further implications of thorough and economical disposal of pin feathers at the processing stage would be that growers could market birds at an earlier age without grade penalization. Pressure on poultry breeders to emphasize light feather color would be lifted. This paper presents results of a study to determine the most efficient combinations of labor and equipment within a practical range of plant scales and operating seasons, with comparisons of the new and old techniques.[1]

Detailed plant descriptions, physical inputs and outputs and cost data were obtained from 30 turkey processing plants. A preliminary survey aided the selection of a group representative of the various scale categories in current operation. Some had recently changed to subscalding and could furnish comparative data. Full coverage of all their operations was achieved in 16. The sample of plants studied handled more than 40 per cent of the ten million turkeys marketed annually in California.

The physical data were assembled under the following specifications. Output was defined as the average number of adult broad-breasted bronze males and females processed per hour. Labor requirements were

[1] For a detailed treatment of the empirical material upon which this paper is based see John C. Abbott, *"The Economic Implications of Recent Technical Developments in the Processing of Turkeys,"* Giannini Foundation of Agricultural Economics Mimeo. Report Nov. 172, University of California, (Berkeley, Oct. 1954). For a discussion of theoretical concepts involved in marketing efficiency studies see: L. L. Sammet and B. C. French, "Economic Engineering Methods in Marketing Research," *Journal of Farm Economics,* Vol. XXXV, No. 5 December 1953, pp. 924-36.

expressed in terms of work positions that must be filled if a plant were to operate with reasonable efficiency at its normal capacity. Capacity output was taken as the "instantaneous" rate judged preferable by the plant operator for smooth efficient use of the equipment and crew on a season-long basis.

Certain broad physical relationships were inferred from plotting the plants according to number of workers, floor space and product output. Dressing floor-space requirements increased in step fashion in accordance with the demands of the conveyor systems available. Evisceration floor-space requirements for various outputs approximated to a straight line and showed minor economies of scale.

Whereas few of these plants had adjusted their floor-space allocations to reflect actual differences in subscald and semiscald requirements, a striking divergence was already apparent in the dressing labor employed. Subscald plants achieved pronounced economics of scale. They used some 20 workers for outputs of 550 to 750 turkeys per hour whereas twice as many were employed in semiscald plants with half that output. The distribution of subscald plants again suggested a step function rising at the point where each conveyor was introduced.

The average relationship between labor and output in eviscerating rooms did not differ significantly with the method of scalding.

Statistical relationships were estimated as follows:—

Evisceration floor-space requirements:

$$Y = 6.2617\ X + 444.771;\ \sigma_{xy} = 419.2089$$

where Y = floor space in square feet, X = output of turkeys per hour and σ_{xy} denotes the standard error of estimate.

Subscald dressing labor requirements:

$$Y = 0.03276\ X + 1.181;\ \sigma_{xy} = 2.2916$$

Semiscald dressing labor requirements:

$$Y = 0.14556\ X - 1.264;\ \sigma_{xy} = 5.8479$$

Subscald evisceration labor requirements:

$$Y = 0.12376\ X + 8.8228;\ \sigma_{xy} = 4.1054$$

Semiscald evisceration labor requirements:

$$Y = 0.1031\ X + 11.6882;\ \sigma_{xy} = 6.1175$$

where in each case Y = number of workers, X = output of turkeys per hour and σ_{xy} denotes the standard error of estimate.

These average relationships provided a basis for the construction of synthetic standardized plants as a means to a more precise consideration of the critical issues. The sample plants all had their own particular idiosyncracies. They presented a situation where computation of average costs by regression on the raw data would tend to obscure the effect of strategic efficiency factors.[2] Ideally the operations of the synthetic plants should be held constant with respect to the general range of variables bearing on efficiency, while the net effect of changes in specific selected factors is evaluated.

Standardized plants A, B, C and D, with capacity ratings of 60, 300, 600 and 1,200 turkeys per hour respectively, were formulated in reflection of modal increases in scale among the plants studied. Input-output data from the sample plants approximating to each technical mode furnished the bases for estimating the performance assigned to each standardized unit.[3] A reasonable level of efficiency was assured by adjustments effected in the data before the appropriate average relationships were embodied in the synthetic series. Physical combinations of buildings, equipment and other production factors found in the sample plants were checked against manufacturing specifications and other published sources. Weaknesses were eliminated where superior performance was evident in other plants employing the same system under comparable conditions. However, the over-all labor/output or equipment/output ratios applied to the synthetic plants never exceeded those attained in some of the sample concerns. Practical consistency in the synthetic structures was verified by consultation with plant operators and an experienced poultry processing technologist.[4]

The differentials between the two methods in respect to each major cost item are summarized in the following table. For convenience, unit overhead costs are compared on a basis of the operating season normal to the plants studied: A 30 days, B 60, C and D 100 days.

The major saving in picking-labor costs in each plant justifies a change from semiscald to subscald techniques at all levels of operation. The other differences are relatively insignificant.

A simultaneous evaluation of scalding method, scale of plant and duration of operating season as factors influencing efficiency is facilitated by

[2] H. E. Erdman, "Interpretation of Variations in Cost Data for a Group of Individual Firms," *Journal of Farm Economics*, Vol. XXVI, No. 2, May, 1944, pp. 388-391, and R. G. Bressler, "Research Determination of Economies of Scale," *Journal of Farm Economics*, Vol. XXVII, No. 3, August, 1945, pp. 526-539.

[3] See E. L. Baum, J. E. Faris and H. C. Walkup, *Economies of Scale in the Operation of Fryer Processing Plants with special reference to Washington.* Washington Agric. Exp. Station Technical Bulletin No. 7, (Pullman, August, 1952).

[4] G. F. Stewart, Dept. of Poultry Husbandry, University of California, Davis.

COMPARISON OF SUBSCALD AND SEMISCALD TURKEY PROCESSING COSTS

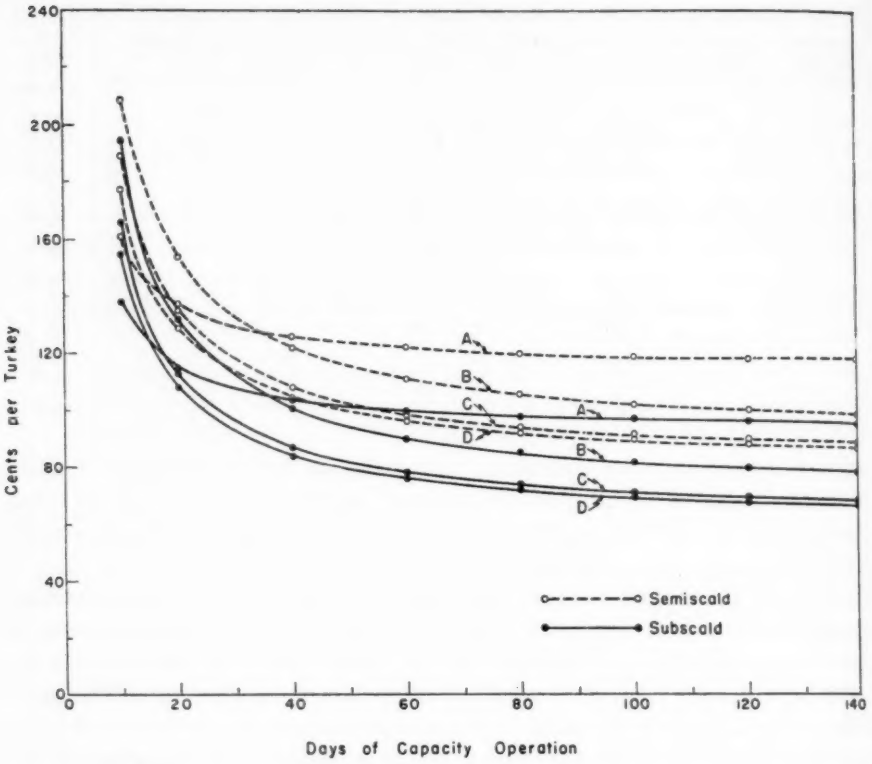
Standardized Plant	Turkeys per hr.		Labor	Utilities	Ice	Packaging materials	Miscellaneous	Overheads	Total
			Cents per turkey						
A	60	Semiscald	63.70	0.54	13.50	35.23	0.60	15.82	129.39
		Subscald	41.77	0.52	13.50	35.23	0.60	15.39	107.01
		Difference	21.93	0.02	—	—	—	0.43	22.38
B	300	Semiscald	53.38	0.94	5.40	27.55	1.43	21.63	110.33
		Subscald	33.56	0.93	5.40	27.55	1.43	20.75	89.62
		Difference	19.82	0.01	—	—	—	0.88	20.71
C	600	Semiscald	46.77	0.66	4.50	27.10	1.07	10.91	91.01
		Subscald	27.01	0.64	4.50	27.10	1.07	10.52	70.84
		Difference	19.76	0.02	—	—	—	0.39	20.17
D	1200	Semiscald	46.77	0.61	4.50	26.95	0.71	9.80	89.34
		Subscald	27.01	0.59	4.50	26.95	0.71	9.50	69.26
		Difference	19.76	0.02	—	—	—	0.30	20.08

the following figure which allows for variations in the incidence of fixed costs. For plants of all sizes the ratio of variable to fixed costs is lower under subscald procedure than semiscald. Accordingly somewhat greater benefits ensue from expanding seasonal outputs.

The larger plants reduce total unit costs substantially by extending capacity operation up to 60 days. The potential saving between seasons of 60 and 100 days is a further 8 to 9 per cent. Plants of size C and D are the most economical provided they operate for at least 20 days. The gains from expanding to model D barely exceed 2 cents per turkey or 3.5 per cent. Evidently plants operating a single conveyor with an output in the region of 600 turkeys per hour achieve the major technical economies feasible with the equipment in current use. Such economies as D offers spring from savings in administrative overheads and purchases of material.

Over seasons of shorter duration A is the most efficient plant, as befits one designed primarily to handle a single farm flock. Its costs continue to fall steadily up to seasons of 40 days, but there is little scope for further output economies. Fifty per cent of its comparative disadvantage is attributable to high labor costs, the remainder largely to high purchase prices for ice and packaging materials delivered in small lots. Plant B cannot approach the efficiency of the more intensive line at any level of output. It is a victim of pure economies of scale.

Economies achieved at the processing stage would be vitiated if they raised costs by a commensurate amount in other phases of the marketing sequence. This aspect of the new technique merits appropriate consideration. The transportation of live birds from the grower to the plant is not affected by the method of processing. However, although subscalded carcasses may be distributed fresh when they are enclosed moist in the



vacuumized wrapper and packed in ice, eviscerating plants run less risk of product deterioration and attain greater freedom in processing and marketing when they have access to quick-freezing facilities. The cost of freezing should be set partly against the economies of subscald picking and partly against potential savings in spoilage and place-time extension of the market. Further compensations are forthcoming from the reduction in processors' weight losses achieved under the new method. The practice of exposing dressed carcasses overnight in 34° F. cooling rooms results in weight losses through dehydration. Ice water cooling, forced on the subscald processor by the threat of surface discoloration, not merely eliminates dehydration losses but may add weight, that is retained by the moisture proof wrapper. Irrespective of consumer preference for moist or dry poultry meat, it is evident that the competitive advantage of plants obtaining processing yields of 82-85 per cent over others obtaining only 75-78 per cent will more than compensate for greater outlays on ice-cooling, packaging and freezing.[5]

[5] Processing yield estimates were derived from the plants studied and certain laboratory tests. See R. J. Connolly, H. R. Miller and G. F. Stewart, "Chilling

Some comparison with the New York Dressed method of marketing poultry is in order at this stage. In this form most poultry can be distributed fresh with the minimum expenditure on packaging and freezing. Labor inputs were estimated for New York dressing plants comparable in scale to models A, B, C and D, and for evisceration in various types of retail outlets. If the retailers spend three minutes on each bird, then at going wage rates ready-to-cook turkeys from a large subscalding plant effect an economy in total processing labor costs of more than 13.0 cents per turkey. The additional cost of packaging and freezing subscalded poultry would be some 22.0 cents per turkey. Against the differential of some 9 cents per bird may be set advantages in appearance, in handling convenience, and in economy in weight loss associated with the subscalded product.

The wider economic implications of adaptation to a changed technical environment may be considered on two levels. Individual processors will be affected by new emphases in the pressure of competition. Limited opportunity to translate the time saved into profitable alternatives might make the new methods seem less attractive to small processors and retail butchers. However, on a basis of comparable opportunity costs and internal efficiency, plants adhering to the older practices would face serious competitive handicaps. Plants that have benefited from lower relative wage levels will receive less protection therefrom and the process of concentration of the industry into larger units will receive additional impetus.

On the level of regional and industry competition it may be inferred broadly that areas with a relatively higher wage structure will gain more than proportionately over those now benefiting from lower processing wage levels, especially if refrigeration facilities are more readily available in the former. Lower net freight costs to distant markets, as between the West Coast and New York City, will also aid the more distant producing areas relatively to those nearer at hand provided that the weight saving from evisceration and the additional protection from freezing are not counterbalanced by higher rail refrigeration costs. Finally, the whole poultry industry is likely to encroach further on the share of the meat market held by beef, pork and mutton as a result of a unilateral reduction in processing costs and some increase in consumer appeal through self-service convenience.

Eviscerated Poultry in Flowing Liquid," *Refrigeration Engineering*, Vol. 62 No. 10 (Oct. 1954) pp. 54-57. (At a live weight price of 30 cents per pound the difference in weight loss would amount to approximately 2.0 cents per pound or 44.0 cents per turkey.)

TOWARD A MORE MEANINGFUL CONCEPT OF MARKETING EFFICENCY*

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WHEN Congress passed the legislation stimulating increased efforts in marketing research and extension, many congressmen obviously believed that "efficiency" had meaning as a concept and that "improvement in efficiency" was a justifyable goal. What is meant by marketing efficiency? How can it be measured? These questions have been the subject of many discussions among agricultural economists. They also have had the attention of professional workers in each of the national marketing workshops held annually since 1949. In opening the 1949 workshop held at Minnesota, O. V. Wells said "I shall argue that I do not ordinarily know how to measure efficiency and I doubt whether our so-called efficiency experts know how."[1] Regardless of this opening disclaimer, in each of the succeeding workshops at least one of the work groups has wrestled with definition and measurement of efficiency. In addition, the subject has crept into many other writings.

Wide agreement can be reached upon the idea that, "The efficiency of the marketing system and of its segments must ultimately be evaluated in terms of effectiveness with which these purposes are served: the relationship between consumption utility and the resources used in its creation."[2] What is to be included in the make-up of utility? How is it to be measured? The size of this conceptual mountain and the difficulties involved in conquering it led to a series of limited efficiency definitions that appeared to offer more hope for practical measurement and use.

The Dichotomy of Efficiency and Welfare

One line of thought sharply separates efficiency ends from welfare ends. Fred Waugh, in the preface to the efficiency section of his book, *Readings on Agricultural Marketing*, said that the unsophisticated held the false assumption that everyone is in favor of efficiency. "Actually the public may prefer to keep some known inefficiencies rather than to adopt new methods—especially if prospective improvements in efficiency might reduce employment, decrease price competition, or lead to greater concentration of economic power."[3] Obviously, Waugh assumed that many

* Journal Paper No. 936 of the Indian Agricultural Experiment Station.

[1] *Proceedings*, 1949 National Marketing Workshop, University of Minnesota, p. 18.

[2] *Proceedings*, 1950 National Marketing Workshop, Purdue University, pp. 183-189.

[3] F. V. Waugh, *Readings on Agricultural Marketing*, Ames: Iowa State College Press, 1954, p. 195.

of the things people put into their satisfaction equation are not included in the efficiency equation.

Bressler also has developed efficiency as separated from general welfare. "Efficiency is only one aspect of general welfare and cannot be used to define a unique set of goals and policies for society."[4] Cochrane also has presented the efficiency objectives as separate and not necessarily compatible with what he called equity objectives. In this context he maintained that in our opulent society equity problems are far more pressing.[5]

The above cleavage seems to arise when the utilities to be maximized are considered as only those measured by the pricing system, the workings of the "economic man." All other things that man seeks in maximizing his welfare are outside this efficiency framework. Certainly under these limits efficiency goals and welfare goals are not synonymous. In fact they may be in conflict.

The Dichotomy of Operating Efficiency and Pricing Efficiency

Another line of thought separates input-output operating efficiency from a loosely defined pricing efficiency. This conceptual dichotomy of marketing efficiency has had considerable acceptance. In fact, two of the national marketing workshops were developed to consider research that would increase efficiency using this dual classification.

Brunk, in developing the concept of operating efficiency, held that one of the primary purposes of marketing research is to find ways of increasing efficiency in the physical handling and processing of goods.[6] Out of this has come the sizeable group who are interested in the various techniques of motion and time analysis, plant layouts, etc. This concept of efficiency has had considerable appeal for it permits tangible measurement in such terms as output per man hour and so many minutes saved. But the narrow applicability of operational efficiency and its dependence upon pricing machinery has been recognized. Brunk stated further "The attitude that we take in our marketing research must be one of increasing the efficiency of the marketing agency with which we are working, so that the marketing agency can profit by it. We will then leave it to competition to pass the advantage along to producers and consumers." Another group at the same workshop concluded "We must recognize

[4] R. G. Bressler, Jr., "Efficiency in the Production of Marketing Service," as quoted by Waugh, *ibid.* p. 236.

[5] W. W. Cochrane, "A Theoretical Scaffolding for Considering Governmental Pricing Policies in Agriculture," *Proceedings*, 1952 National Marketing Workshop, Texas A & M College, pp. 62-75.

[6] M. Brunk, "Marketing Research in Operational Efficiency," *Proceedings*, 1950 National Marketing Workshop, pp. 34-40.

that operational efficiency judgment assumes the existing structure of prices and price-making mechanisms—improvements in operation efficiency cannot be finally evaluated without consideration of their effects upon pricing efficiency."[7] Just what is meant by pricing efficiency is not so easy to tie down. A workshop group dealing with pricing and trade, concluded that in measuring economic or pricing efficiency it must be assumed that prices measured comparative values. From this rather tremendous assumption, the group then fell back upon the marginal analysis of the competitive model. However, another group of the same workshop concluded that "The socially desired kind and degree of competition is not clear. Economists have in the past left this problem to the legal interpretation of the courts." Still another group concluded "To indicate improvement in pricing, researchers must have some conception of what constitutes improvement and how it will be accomplished."[8]

Evidently if we are willing to accept the present pricing structure, the concept of operational efficiency can be handled with meaning. But improvement in pricing efficiency seems to mean little without some theoretical model as a benchmark or goal. The most concrete model seems to be that of perfect competition. But one must seriously question this unreal model as a benchmark toward which we are going to measure improvement.

An Over-all Concept of Efficiency

From the above it is obvious that in struggling to be definitive in what is meant by improved efficiency, the efficiency concept has been given a limited viewpoint. But equally obvious is the fact that the use of either efficiency as separate from welfare or of operational as separate from pricing efficiency is not adequate. To the lay public increased efficiency apparently is good and desirable. Conceptual frameworks that lead us to "on one hand it is good and on the other hand it is bad" answers are not very useful.

At the 1955 National Marketing Workshop, the group assigned to the subject of "Underlying Objectives of Marketing Programs" rejected various dichotomous classifications. Instead the group held that efficiency is a single concept defined as the ratio of ends to resources.[9] The ends are to be considered either in the broadest or the narrowest sense depending upon the particular problem at hand.

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[7] *Ibid.*, pp. 183-189.

[8] *Proceedings*, 1952 National Marketing Workshop, pp. 173-180, 222-239.

[9] The following is taken from the report of Group I, *Proceedings*, 1955 National Marketing Workshop, University of Kentucky, pp. 179-192.

If the problem is one of firm or intrafirm efficiency, the formulation of the ends in measurable terms may be relatively simple. If the problem is one concerning efficiencies of the whole marketing system, the framework of the ends must be worked through giving explicit consideration to all of the value judgments involved. At this level, quantification of the ends may be impossible. This means that the difficulty of giving definitive answers to such broad issues is acknowledged rather than avoided through the process of whittling the concept down to where something can be said that is not relevant to the total problem.

The work group illustrated the problem of formulating the total utility output at the various levels of aggregation as follows:

1. At the economy-as-a-whole level such things as freedom, security, stability, optimum growth, level of output, composition and distribution of output, organization of production (degree of competition) and distribution of income must be considered.
2. At the industry level such things as security, stability, growth, output level, composition and distribution, product quality, nature of competitive organization and nature of regulating measures must be considered.
3. At the firm level such things as profitability, growth, level and nature of output, market power, public relations and acceptability, uncertainty and provisions for research would define the utility of the output of the firm.
4. At the intra-firm level considerations as to level and quality of the product output and contributions to firm profit become of major importance.

The ease of specifying and quantifying the pertinent ends decreases as one moves up through the larger levels of aggregation. Much of the popularity of so-called operational efficiency studies probably stems from the fact that they deal primarily at the intrafirm and firm levels where the formulation of ends in measurable terms is relatively simple. Much of the haziness surrounding work in the so-called pricing efficiency studies probably arises because such studies must deal with higher levels of aggregation where the measurement of pertinent ends becomes more subjective.

The usefulness of this framework can be further explored by working a specific research finding up through the levels of analysis. Suppose a new device greatly increased the output (and maintained quality) of a specific operation of a firm. After study, it could be ascertained that unit costs would be reduced upon its adoption. This certainly would be considered as increasing efficiency at the intrafirm level. Suppose that such an innovation would also increase total firm profits and permit the increased growth and market power of the firm. From the firm viewpoint, this might be judged as increasing efficiency. However, at the industry level, the potentiality of fewer firms might bring on additional govern-

mental regulation. At the economy level this might mean more monopoly power and the possibility of increased unemployment and stagnation of growth. Here then it would be judged as actually decreasing the level of efficiency.

Such a formulation framework permits the evaluation of any study of efficiency. It recognizes that inconsistencies may exist in maximizing efficiency within and among ends and levels of aggregation. This requires that the researcher must know what he is doing and what the implications are. This also permits recognition of the existence of certain givens or restraints that society—through social, political and economic activities—has agreed on at any one time. The work group suggested the following as examples of the widely varied nature of these constraints:

1. Activities that reduce competition are generally considered unlawful.
2. Modern technological capital is imperfectly mobile and divisible.
3. Labor may be employed under minimum length of work week and wage provisions.
4. Pure food and drug laws dictate certain product characteristics.

Implications to Marketing Research of a Total Efficiency Concept

Such a formulation of efficiency would appear to offer several challenges to researchers:

1. Certainly it does not mean that every research project must be undertaken a grandiose scale extending through all levels of aggregation. Progress will still come from the well-planned attack on small parts with limited ends. But it does mean that some must shoulder the responsibility of evaluating and synthesizing these parts to discover their significance at the higher levels of aggregation.
2. Workers in policy and workers in marketing must sooner or later join forces. Too much policy work is narrowly oriented to the price effects with little consideration to the effects on marketing structures and activities. And the implications of much marketing research cannot be fully thought through such an efficiency framework without running head on into policy considerations.
3. The marketing researcher is challenged to seek the council and aid of his colleagues in history, political science, sociology and psychology. Many of the ends he would seek to delineate and measure are the direct concerns of these disciplines. A current fad in agricultural marketing is to emphasize the necessity of teamwork with commodity specialists, engineers, chemists, etc. Each of the national workshops has emphasized the importance of the cooperation with these individuals and has invited their attendance. But economists are social scientists. Many of the larger marketing problems are social not technical problems. Methods must be found by which the talents of other social scientists can be utilized. Ways to obtain coordination with this group must be explored with as much vigor by administrators as they have shown in obtaining the services of engineers and chemists.

By defining the output of utility in its broadest sense the above concept of efficiency builds around the common-place acceptance that efficiency is "good." Instead of splitting utility ideas "vertically" by the use of welfare *vs.* efficiency, or operations *vs.* pricing, it promotes a "horizontal" differentiation on the basis of the intrafirm, firm and total economy levels of aggregation. The formulation of methods of measurement will require constructive and imaginative effort. The evolution of the work groups in the national workshops shows progress. This last formulation deserves further thought and development.

THE PLACE OF THE EXTENSION SPECIALIST IN FARM AND HOME COUNSELING*

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IN DISCUSSING the role of the extension specialist in farm and home counseling we are suggesting that farmers and home makers systematize their goals, analyze their problems, and apply objectivity and disciplines that will result in improved decisions and more efficient resource use. Within the extension service this shift towards critical self-examination and movement from the general to the specific is a form of experimental medicine. Probably it is fitting that the dosage be arrived at through self-administration.

In this order what are *our* goals, *our* framework of analysis and *our* disciplines in so far as the extension specialist is involved in the "unit approach"?

Goals and Objectives

The broad goals or objectives of this program have already been outlined to us. Our job is not, at this point at least, to question these objectives but rather to accommodate ourselves to them. They are of sufficient importance to review.

First: The "unit approach" is *basically an educational program and not a service program.* In the strict sense of the word, it is not a program but rather an educational method or technique.

Second: The goal of this "unit approach" is to maximize satisfactions at the family level. This program is concerned with people and not things. The family is the end product and not the by-product.

Third: The *economic concern* as related to maximization of satisfaction stems from the desirability of improved decision making on the part of farm and home managers. Their problem is how to apply limited resources to alternative uses in order to maximize given ends.

If this concept is true—if reinforced decision making is our basic goal—then I think our maximum inputs as extension workers must lie in the problem of methods and educational techniques, rather than in specific subject matter.

As extension specialists, what we are really seeking is to have people make better use of the technological data we are hired to disperse. By better use I mean more precise use relative to the resources and goals to which this technology is to be applied.

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* Paper prepared for extension specialists seminar on Farm and Home Counseling, February 21, 1955.

Farm Situation

Let us make a practical appraisal of the situation in which most farm families find themselves. In setting forth their problems, what areas do families leave open for the type of assistance we can provide? I suggest that we will have large concern with the technical organization of the farm and home business under those conditions where more efficient resource use is essential to the family's goals. These situations will occur whenever goal attainment is dependent on more net income.

What are the real shapes or forms of the problems involved? Basically, problems center around the factor of change in technology, in market demands, prices, costs of production items and the like. These changes are beyond the control of the operator and the extension specialist. The area of action for both the farmer and the technician thus becomes somewhat more clear and more narrow. The individual must meet exterior changes through interior reorganization of his resources. Decisions available to him concern increasing the efficiency with which he uses resources at his disposal relative to his competitors. His problem resolves itself into selecting the kinds, amounts and times of applying technology that is new to his firm. This selection problem has become increasingly difficult in recent years.

Even with a highly specialized enterprise we have to select among a continuously larger number of production alternatives. Each new discovery gives another way of using resources, and many of the newer technologies are incorporated into the firm only at substantially large cash outlays.

This presents us (1) with more alternatives among which to choose, (2) with necessity of more knowledge on part of the manager, and (3) with a need for greater precision in the making of decisions.

The farm operator faces two sets of problems. The first is how to analyze and make precise decisions. The second, distinct and separate from the first, is the acquisition of data on input-output costs and returns. I am personally of the conviction that the farm plan and budget method of analysis is the best vehicle available at present.

Prerequisites to Adoption of New Technology

Let us move towards discussing new technology as it relates to the extension specialist. What is the position of the farm manager when we reach him?

A. The competitive position of the producer must be such that he hopes through production changes to increase or maintain net income, i.e., desire for change must be present.
B. New production techniques must be available and made known to him.

C. The new technology must be related in time of appearance to necessary supplementary conditions for adoption.
D. The nature of the technical data must be such that it can be placed within a manageable framework of analysis.
E. The manager must possess the ability to make a reasonably accurate evaluation of the techniques or inventions applied to his resources.

Extension Specialist's Task

The extension specialist is involved in the last four of these five conditions. (a) He must assist in the distribution of new technical information. This is a job we have done well in the past and must continue with greater emphasis in the future, as new discovery increases in near geometric proportions. (b) The extension specialist—because of particular knowledge, wide experience and insight—can frequently visualize and sometimes invent or hasten the development of necessary corollary conditions to allow the adoption of an out-of-phase piece of technology. (c) The extension specialist must review new technology with its inventor and assist in putting the data in manageable form. By manageable form I mean a form that can be translated by the farm operator into meaningful application to his particular unit.

The job of the extension specialist here is to bridge the gap between the research laboratory and the farm. There are in fact two gaps: a gap in language and a gap between the controlled experiment and the on-the-farm use where conditions may vary from the control. Here again this is not a new job for the extension specialist; but under the "unit approach" the job takes on new emphasis. We are faced with a chore of some magnitude. Many of our technical input-output data have been derived from experiments where only a single item is variable or where variables have been altered only over very narrow ranges of inputs. In many cases experiments have been conducted only on one level of a resource measured in terms of the inherent ability of the resource to respond, i.e., a single soil type or cows of a given level of capacity. The people we counsel use resources at all levels of inherent capacity and at various rates of intensity.

Questions and Problems

Do we have the know-how to assist in making adequate economic adjustments when these adjustments require different rates of inputs and give different rates of responses? Do we have data on input-output relationships on other than optimum level resources? Has our "recommended-practices" approach left us inadequately equipped to make specific applications of technology to unique and different sets of resources on individual farms, especially farms with low capacity resources?

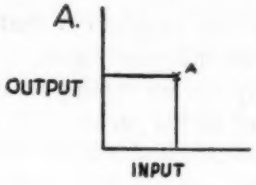
CHART I. A SUGGESTED CLASSIFICATION OF INPUT-OUTPUT RELATIONSHIPS

The situation:

A single point or "all or none" response. No alternative levels of application exist.

The implication:

The practice either "pays" or does not.

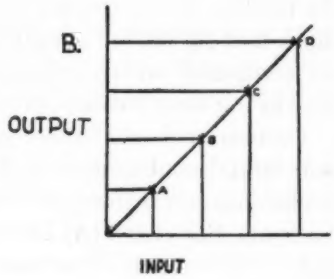


The situation:

A linear or constant response in terms of output as related to input. No diminishing returns. Until "capacity" of fixed factor is reached.

The implication:

If it "pays" to make inputs at level A total net returns will be proportionately greater at point B, still greater at C, etc.

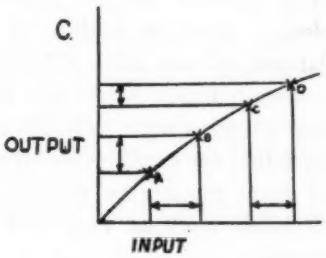


The situation:

Typical diminishing returns response. As inputs are added output per unit of input gradually decreases.

The implication:

The point at which to stop applying inputs is decided by the cost-price relationship. At some point the price paid for the output will just cover the cost of the last added input.

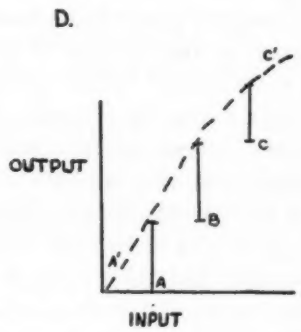


The situation:

Units of input are not divisible into small applications.

The implication:

Whether this type of adjustment will "pay" or not depends on the output capacity of the resource to which it is being applied (where the input falls on line A' — C').

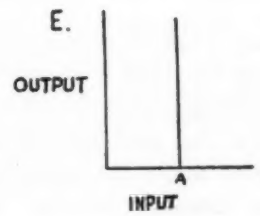


The situation:

A single input extends over a large range of output and this situation is a limited case of D above.

The implication:

The greater are the number of units that can be produced in relation to this input the lower is the unit cost for the input involved.



Part of our problem is that the marginal value of each resource is different on different farms.

Lastly are we equipped as extension specialists to assist the individual operator in his problem of how to apply technical data to a *unique set of resource combination*? This is where the "unit approach" forces each extension specialist to appraise the possible results of his subject matter in relation to its impact (1) on the organization of other areas of the farm and (2) on the marginal return from this application of technology, as compared with further applications of labor or capital somewhere else in the farm business organization.

Certain reclassifications of our technical information might make a substantial contribution to both teaching and farm budgeting. The first reclassification is in regard to the type of production function with which we work. See chart. (A) Does some of our technical data give only a single point response, an all or none application? Medication of livestock at less than specific dosage gives no results, for example. More than specific dosage gives no additional benefits. (B) Are there any input-output relationships not subject to the law of diminishing returns over the range normally used? (C) Which input-output functions have a typical diminishing returns shape? (D) Which functions involve units of input not readily divisible for continuous application over an extended range? Many kinds of farm machinery provide examples. (E) Are there any single inputs divisible over an extended range of output? The farm pond is an example.

A second possible reclassification of technology might be in terms of impact on net income. Which pieces of technology have little influence on net income? Which pieces make substantial difference? Disease control measures, for example, may involve small costs but have large effects on net returns, whereas various types of poultry litter may represent a considerable cost but have almost no effect on net income.

A third reclassification might be by the degree of precision with which the particular technology should be applied.

Lastly, technology might be reclassified in terms of its impact on other segments of the farm organization outside its particular subject matter.

A Teaching Problem

I have mentioned some of these classification possibilities, not because they say very much about how the extension specialist directly fits into the "unit approach" but because indirectly, at least, I feel our problem is a teaching problem. Perhaps some reorganization of subject matter data may make the teaching chore easier to handle both by ourselves and by county extension personnel. Receiving of instruction on the

part of farm managers may become simpler than at present.

Also in a very practical sense some of these reclassifications of data could result in increasing our efficiency materially in the use of time when working with individual families. Obviously we need to do the most pencil pushing or precise job of budgeting with those data that either have substantial effect on net income or that must be applied rather precisely to the particular resources involved. If certain data do not have much effect on net income or can only be applied in a gross manner, rule-of-thumb procedures can be used and much time-consuming chore work at the actual planning or budgeting stage can be eliminated.

Conclusion

The extension specialist has the following role to play in the "unit approach."

1. In extension work the county staffs are the counselors. The problem of family goals and values is presumably settled and outside the province of the extension specialist.
2. The degree of involvement of the extension specialist in counseling is largely in proportion to the extent that the maintenance or improvement of net farm income is a means of achieving family satisfactions.
3. Under the "unit-approach" conditions the burden of the extension specialist in interpreting research data is increased. He must be prepared to supply analyses and data for optimum or typical resource levels and combinations and for unique resource combinations and resources of various capacities.
4. Certain reclassification and reorganization of data may contribute to the ease and speed with which the fundamental teaching job can be done. The extension specialist in the farm counseling role is concerned with methods of analysis and evaluation rather than with specific subject matter data.
5. Any technological adjustment having either supplementary or complementary effects on any other segment of the farm business can only be appraised properly when these effects are also appraised. Such analysis or appraisal may require the attention of more than one extension specialist. Generally the use of a full budget, rather than a partial budget, is required for this type of situation.
6. The proper standard for appraising an adjustment is in terms of its effect on the family's goals. In this connection we must eliminate our own values concerning such noneconomic ends as good, bad, color, appearance, etc.
7. The role of the extension specialist is essentially that of teacher rather than adviser. The responsibility for final decisions must rest with the farm family.
8. The primary job of the extension specialist is to counsel and instruct county personnel rather than personally to solve myriad individual problems encountered in each specific counseling undertaking.
9. There is no problem solving possible until alternatives exist. As soon as an alternative exists the problem ceases to be entirely technical and becomes at least partially economic.

BASIC LOGIC IN FARM AND HOME PLANNING IN EXTENSION EDUCATION*

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THE recent impetus given to farm and home planning will fill several voids that have existed in agricultural extension work. Increased emphasis in farm and home planning is partly a recognition of the growing demand for economics education. Although the label *economics* may not be attached to farm and home development in most states, the need and desire for assistance in this sphere of knowledge is obvious. Economics is the science of choice and decision making; planning must relate to some end to be maximized. Administrators and farm groups evidently are asking for more aid in this sphere, as well as in other spheres of the social sciences that contribute to greater profits of farms and greater satisfactions of farm families or households. All phases of farm and home technology (e.g. biological and physical practices) are still involved in planning and necessarily can contribute greatly to the ends mentioned. Recommendations from these fields, particularly if they are tempered to meet the farm situation explained below, have increased possibilities in number of farms reached and in rate of adoption of recommendations. However, the actual principles in choices or decision will necessarily be those of economics (and related fields) if a full attainment of planning ends is realized.

Farm and home planning, if carried out in the economic interpretation of choice, will overcome some of the traditional asumptions implicit in recommendations to farmers. Although this overstates the case somewhat, one is not entirely wrong in saying that the dominant assumptions of the firm originally used in extension recommendations are the following:

1. The farmer has unlimited capital and no particular equity limitations.

2. A limitless planning horizon exists and one plan is better, even if it requires large capital outlays, as long as it brings in greater income sometime in the future. (Discounting of income based on recommendations requiring large capital outlays for conservation systems, livestock, buildings and machinery would often show recommended practices to have "lower present values" than the *apparently inefficient* systems already used by farmers.)

3. The economic unit of relevance is a firm with profit maximization as its only goal. Farmers may be asked to do things that are not consistent with the more ultimate end of consumption and maximization of house-

* Journal paper J-2785 of the Iowa Agricultural Experiment Station, Project 1135.

hold satisfactions, even though the different operators attach different amounts of utility or disutility to plans involving different degrees of risk and uncertainty.

4. An owner-operator is ordinarily assumed and recommendations on practices are not differentiated among tenant, landlord and owner-operator. The fertilization plan for example that is best for a tenant may be far different from the one best for an owner.

5. Quantities (yields, feed requirements, or results from different practices) are implicitly assumed to be known with near certainty. Hence, the precaution or alterations in plans that a manager may or should use to meet risk and uncertainty conditions are generally given too little consideration.

These implicit assumptions have been more predominant in biological and physical fields than in economics extension education. If farm and home planning is carried to the levels possible and desirable, the implicit assumptions will need to be relaxed further. Recommendations will be more flexible and suited to a wider number of farms and will recognize that different plans or practices are needed depending upon such considerations as (1) the amount of capital controlled by the farmer, (2) the farmer's equity position, (3) the degree of risk and uncertainty involved, (4) the operator's or farm families psychological make-up and willingness to undertake risk, (5) the managerial ability and services available, and (6) the monetary and nonmonetary goals (i.e. the indifference map) of the farm family. By recognizing that each farm is represented by a unique combination of these characteristics (as well as by different situations in respect to soil, to building labor skill, and to other resources), both technological and economic recommendations can be tailored through farm planning to fit the conditions of individual farms. Extension education will find quicker adaptation to a greater number of farms.

But in addition to overcoming these implicit assumptions, more thought can be given the fundamental framework for farm and home development program. We believe that this step is just as important for educational as for research programs. Accordingly, we present some basic concepts that might well be incorporated into farm and home planning.

Basic Goals

The basic economic goal of farm and home development should be maximization of utility for the family. The farm family can use its resources to produce money income (i.e. the things that can be purchased with money income); it also can use these same resources to produce nonmoney or nonmarket goods or services for the family. These nonmarket services include using labor or other resources for leisure, home beautification,

vacations, community participation, education, improved health, family development and general services of the household. Hence, with the "bundle" of resources and skill available to it, the farm family is faced with a set of production possibilities such as curve PP′ shown in figure 1A. In this case it is supposed that the monetary product (i.e. the goods and services that can be purchased with money profits) is complementary with the nonmarket services for the household over some range of resource use (i.e. the possibility curve has a positively sloped portion).[1] Without some money profit, the family does not have the basis for using time, funds or skills for health, vacations, etc. Conversely, the attempt of the family to use time and other resources for profit alone would not allow for biological efficiency of the human; nor would it allow contacts with others to allow a flow of knowledge to farming operations. At some level, however, profit products and nonmarket goods are competitive opportunities. Time set aside for the operator, housewife or children for vacations, home work, community participation etc., can come only at the expense of products for and profit from the market.

Curves I_1D_1, I_2D_2 and I_3D_3 are indifference curves for the family. Their slope indicates the relative values placed by the farm family (1) on goods and services that can be purchased with profits from the firm phase of the firm-household combine, and (2) on services, activities or other items of satisfaction forthcoming directly in the framework of the family phase of the combine. The task of the farm family and extension workers who aid them, is to determine which allocation of resources and skills between the "profit goods" and "nonmarket goods" will maximize satisfactions. Satisfaction or utility is at a maximum when resources are allocated to produce OR of "profit goods" and ON of nonprofit goods, since indifference curve I_3D_3 is tangent to production possibility curve PP′. This indicates that the marginal rate of substitution in production of "profit goods" "and nonmarket goods" is equal to the marginal rate of substitution of the same goods in consumption. All other possible combinations allow less satisfaction because the indifference curves intersect the production possibility curve.

If all farm families were at point 5 in figure 1A, farm and home planning aids would be unnecessary. Given their resources and value systems, supposing that PP′ represents all "efficient sets" of products (i.e. all economically optimum techniques of production), education could not be used to increase the families' welfare. Hence, the assumption of extension work exists that, given the capital available to them, farmers lack knowl-

[1] Actually, the slope of the curve, before it intersects the horizontal axis, also is positively sloped; without some use of labor or time for rest and the physiological and biological activities of the animal world, man cannot exist to labor and think in producing a monetary product.

edge (a) in techniques, (b) in economic organizations of their resources, or (c) in defining their values (indifference curves). The assumption means that, rather than to have selected a point of tangency (i.e. point 5) on the boundaries of production possibilities where indifference and possibility curves are tangent, the farm family has selected a point such as 1, 3 or 4. If it is supposed the preplanning point is 3, the directive in planning is clear: emphasize improved techniques and economic organization of the business. Less attention need be given the household and family values, particularly if the family is clearly aware of its indifference or value system. (A somewhat similar statement can be made about point 1.) If it is supposed that the preplanning point is 4, the directive again is clear: emphasize work with the family and household to move up the boundaries of possibilities to tangency point 5. In all cases, however, sets of relationships must be considered.

Farm Management and Farm Practice Aids

The least complex stage in planning exists when farm families have selected a point on the positively sloped boundaries of the production possibility curve. (Such a point may fall anywhere between P and 2 in figure 1A). Since profit and nonmarket products are complementary over this range, family satisfaction or utility can always be increased by replanning the use of resources; knowledge is not needed about family values (i.e. slopes of indifference curves) for guaranteeing an increase.[2] We would expect that this situation (between points P and 2) exists for a considerable group of farmers. Included here are probably many beginning families who have insufficient knowledge of economic organization or management. They are those acquainted with the technology of farm practices on their father's farm, for example, but lack in management or organizational experience. (The problem is not one of better practices, for the given capital-labor position, since the boundary of the possibility curve has been attained.) Families in this category lack information about how to plan given resources to obtain more both of profit and nonmarket satisfactions. The simple steps of taking "time out" for examining outlook, for making up a farm budget or devising time-saving plans may provide both more income and activities of enjoyment (even leisure) to the family. More important, the greater income may allow purchase of labor-saving devices and other conveniences which themselves provide satisfactions but also allow more time for thought and planning farm organization. We would guess that a considerable group of farmers fall in this first category of "lack of knowledge on organization." Perhaps a large

[2] But the latter statement applies only for movements up the positive portion of PP'.

proportion of share-croppers in the Southeast fall in this category.

A second sphere of planning exists that does not require knowledge of family values (i.e. slopes of indifference curves) for guaranteeing increased satisfactions of the household. It is a point such as 3 in figure 1A. If the farm and family exist at such a point, it is because information is lacking (1) on technology (farm practices) and/or (2) on economic organization of the farm business. This point also might be selected because

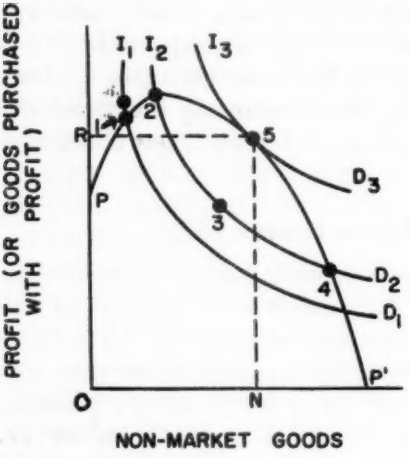

FIGURE 1A

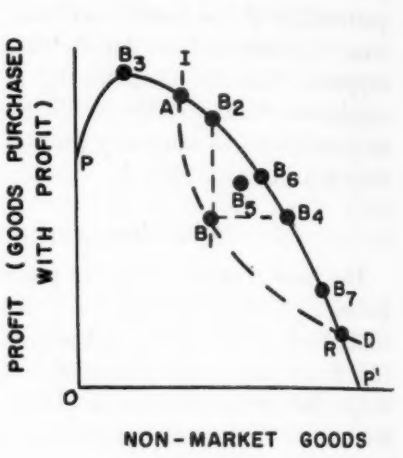

FIGURE 1B

the farm family does not have its values (indifference curve) clearly in mind. This cause is less likely. Without knowledge of family values, planning that guarantees an increase in family satisfactions (i.e. attainment of higher indifference curves) again can be provided. The possibilities of plans that will accomplish this are represented by every point in the quadrant, $B_1B_2B_4$ of figure 1B. Every one of the points, between lines B_1B_2 and B_1B_4 allows greater family welfare, (although it need not guarantee maximum welfare) than the existing plan B_1. This is true because the points (possible plans) fall on higher indifference curves than B_1. Even B_5 is such a point. It does not represent the highest possible utility level that can be attained (without knowledge of family values) since it falls short of the boundaries of the production possibility curve.[3] However, it

[3] We remind the reader that the curve PP' represents the boundaries of all economically efficient techniques or possibilities. Any point within its boundaries represents the same outlay of resources or skills, used with a different set of techniques or organizations. Cf. Earl O. Heady, *Economics of Agricultural Production and Resources Use*, New York: Prentice-Hall, 1952, pp. 238-239 and T. Koopmans, *Activity Analysis of Production and Allocation*, New York: John Wiley, 1951, Ch. 3.

allows more of both "profit products" and "nonmarket products" than does plan B_1. Plan B_4 allows, from the same resources as B_1, more "nonmarket goods" without a sacrifice in profit, and hence is better than B_1. Plan B_2 is better (gives higher family satisfactions) than B_1 since it represents more profits without any sacrifice in "nonmarket products."[4] Plan B_6 allows more of both profit and nonmarket goods" than either B_1 or B_5.

The farm planner cannot say, however, which of the 3 budgeted plans B_2, B_6 or B_4 is best. The best one of these three plans can be specified only if family values (i.e. the indifference map) is known. Hence, we have defined the limits (i.e. the quadrant denoted as $B_1B_2B_4$) of farm planning, for our second category, without knowledge of the families tastes or values Selection of a plan outside this quadrant requires knowledge of family values. Plan B_7 falls outside of this range and knowledge of family tastes is required for specification that it gives greater family welfare than B_1. Plan B_7 allows some gain over B_1 in "nonmarket products." But is the utility of the gain in "home satisfactions" greater or less than that from the sacrifice in profit (or the products money will buy)? The question can be answered only with knowledge of indifference maps.

Importance of Criteria

The importance of the criteria used in farm planning now becomes apparent. If it is purely a biological or physical one, the movement away from point B_1 will generally always be vertical. (This statement assumes that agronomists and animal scientists, for example, do not make recommendations showing the family how to use time for leisure, vacations, community participation, etc.) A recommendation relating alone to practices and crop or livestock yield can represent a vertical move either up or down from B_1. If the practice adds more to income than to costs, it is an upward movement and guarantees greater welfare even if family values are unknown. If the practice adds more to cost than to income (a not unusual case), or diverts resources from more profitable alternatives in the farm, it represents a movement downward from B_1 and, since it gives a point falling outside the quadrant, must lower total family satisfaction.[5]

If plans are based entirely on the criterion of more household activities,

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[4] The curve represents the boundaries of production possibilities from given resources (i.e. all efficient sets). Within boundary points represent the use of the same set of resources but inefficient techniques in the sense that more of one or both products could be increased by changing practices. Ct. Koopmans, *Ibid.*, Ch. 3.

[5] Since the sets of efficient points represented by the boundary of possibilities, PP', supposes the same resources as any "inefficient" set of points falling within the curve PP'. Hence, any practice requiring more costs would require diversion of resources from other alternatives. A practice with lower costs would free resources for other alternatives, etc.

maximum family welfare again need not be guaranteed. For example, a household, home or family specialist who finds a farm family at point B_1 does not guarantee greater satisfaction alone by having the family participate in more community affairs, household planning or family counsels, etc. If the new plan is B_7, it results in greater attainment of these household, home or family accomplishments, but only at the expense of profits. Without knowledge of family values, we cannot say whether the substitution adds to or subtracts from total utility. Generally, then, the home or family specialist will need to be sure that the recommendations do not exceed a horizontal movement from B_1 to B_4. (Supposedly, home or family specialists restrict themselves to this line since they seldom tell the family how to use its resources to make more profits.)

The farm management specialist's sphere of activities has historically covered the full range of the $B_1B_2B_4$ quadrant, although major emphasis has been vertical movement from a point such as B_1. Numerous extension specialists in farm management have rightly taken the position that the main goal of farm resource management is to obtain that combination of "products" that is relevant to the ends of the farm family, whether these be profit or "nonmarket goods." In this sense a horizontal movement from B_1 to B_4, or a diagonal movement from B_1 to the boundaries of the curve, is as relevant as a vertical movement towards B_2 in figure 1B. However, it is also true that magnitude of profit has often been taken as the criterion of a *good farm plan*. On this basis, plan or budget B_2 would always be considered better than plan B_6. Similarly, B_3 would always be classed as "a better plan" than B_2, simply because it provides the family with greater profit. One of the dangers of farm planning is that two budgets, such as B_6 and B_3 will be made out and B_3 will be recommended to the farmer because it promises greater profit. It is obvious, however, that if ID represents one curve of the indifference (family values) map, budget B_3 is less desirable than budget B_2, B_6, B_4, or B_7 (all of which represent profit levels considerably lower than that of B_3). In figure 1A, this same procedure would lead to recommendation of a plan represented by point 2, although the plan represented by point 5 is the one unique plan which gives the very greatest total utility to the family. Hence, we reiterate: without knowledge of the family indifference curve, farm planning can be carried on quite easily and directly, but it must restrict itself to the *Pareto-better area* denoted as $B_1B_2B_4$ and represent movements from B_1 to the boundaries of possibilities.[6] Without knowledge of the indifference map, "better budgets" can not even be selected on the curve or boundaries of the Pareto area between B_2 and B_4.

[6] We use Pareto-better to mean: a plan that gives greater welfare than the existing plan but that does not guarantee maximum welfare (i.e. family satisfaction).

Family Values and Planning

To provide farm plans that guarantee maximum satisfaction, production economics and consumption economics must join hands. This step is necessary to approximate the unique use of resources wherein the pair of marginal rates of substitution give equation at point 5 in figure 1A. However, even without specification of this single optimum integration of consumer values (indifference maps) allow a wider sphere of farm and household planning than outlined previously. Without knowledge of the indifference map the range of Pareto-better plans was restricted to area $B_1B_2B_4$ in figure 1B. However, if knowledge of a single indifference curve such as ID (without knowledge of the entire map) can be approximated, the sphere of planning that provides Pareto-better budgets is greatly broadened. It now includes the entire area encompassed by the arcs of the production possibility and indifference curves, as defined by their intersection at A and R. Any plan to the right and above the indifference curve ID will result in greater family satisfaction than the plan denoted as B_1. Plan or budget B_7, for example is better than B_1. It is still true, of course, that one "best" plan cannot be selected on the boundaries of production possibilities (i.e. budget B_7 cannot be selected over B_6, etc.) without knowledge of the entire indifference map. However, simple measurement of family values and iso-satisfaction levels can greatly widen the possible sphere of farm and home planning.

In a practical sense, one need only determine points A and R to broaden the sphere of Pareto-better plans beyond the area $B_1B_2B_4$. If we already have knowledge of B_1 (i.e. the "existing" farm and home plan) and can approximate points A and R, we can draw straight lines from B_1 to A and from B_1 to R. The area above these lines but not exceeding the boundaries of production possibilities, represent a *modified Pareto-better* area for planning. While it does not exhaust (by the amount of the area between the two straight lines and the indifference curve) the total Pareto-better area, the modified area gives a greater sphere for planning than does area $B_1B_2B_4$ which does not consider consumer values.

The question now arises: How do we locate points A and R to determine the modified Pareto-better area? One possibility is this: Given the initial situation at B_1, we might inquire how much of nonmarket goods, services or activities, the family is willing to give up to attain a higher profit; a restriction being that total expected satisfactions must not be decreased. By pressing forward on this question, we finally reach point A. Once the family says that additional profit would require too great a sacrifice in "nonmarket goods" (i.e. would lower total satisfactions), the point so defined is to the left of A. The same procedure then would be followed to determine point R.

Measuring Goals or Values

Defining the optimum plan for the farm family requires going beyond determination of points A and R. It requires approximation of the entire map of the indifference curve. It requires knowledge of the slope of the family of indifference curves and, hence, of the relative values that farm families place upon different items or activities of consumption. We doubt that extension workers can or should do much about selecting this *final optimum.* The choice should be left up to the family, after they have been provided the relevant economic principles for making choices. However, the point made is of importance to those who wish to deal with values or goals in relation to farm and home planning.[7] It is not sufficient to obtain a simple listing of goals or values of the farm family. A simple listing tells nothing about the slope of the indifference curve. At the extreme, a listing of goals (values) in order of their priority suppose the indifference curves are linear and intersect the axes. While this queer situation may exist for some pairs of consumer activities or goods, it is indeed the exception.

In other words, farm families do not give farm ownership or community participation priority over all other possibilities. If they did, they would push these particular goals to the limit while they starved to death or gave their children no education (a straight-line indifference curve). Farm ownership or community participation, as examples, can be attained in different degrees. One can own 10, 100 or 10,000 acres or go to hundreds of meetings. He must decide on the degree of ownership or group participation consistent with other goals. Since, farm families combine several goals in what they consider to be optimum degrees, they obviously express convex indifference curves. Hence, we reiterate: the extension worker investigating goals or values must go beyond a simple listing or ranking of these; he must, in effect, specify the slopes of the indifference curves if he is going to push towards a plan that represents the ultimate optimum.

Changing Production Possibilities and Values

Once an ultimate optimum plan has been attained for a given boundary of production possibilities, there are two certain ways of increasing farm family welfare: (1) The farm family can obtain more resources and push the entire production possibility curve upwards. For beginning farmers

[7] Many, perhaps most, persons working with farm planning talk in terms of goals and values. It is pointed out, rightly, that knowledge of these is necessary before an optimum use of physical and human resources (including time, etc.) can be approximated. Persons also are interested in goals on benchmark studies relating to the progress and accomplishments of farm and home planning program.

or others who are short on capital, priorities in planning perhaps should be (a) in moving from point B_1 outwards (i.e. by new farm practices and better management plans with existing resources) into one of the Pareto-better areas, and (b) in obtaining more resources to move to a new boundary curve of production possibilities. We suspect that the latter represents the very great opportunity for increasing income. (2) The production possibility curve, and its slope at any point, can be changed by new techniques. Developing new farm practices or technologies alone has the effect shown in figure 2A. The production possibility curve is

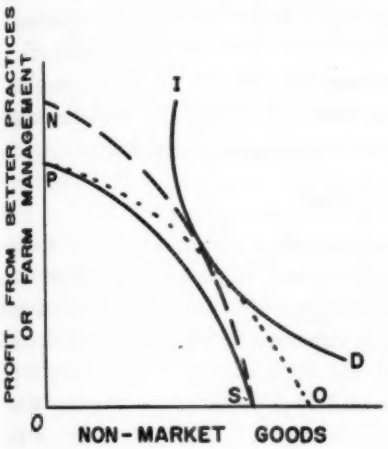

FIGURE 2A

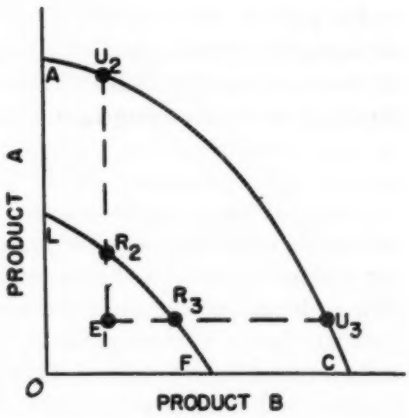

FIGURE 2B

lifted upwards to the left of the point at which it intersects the horizontal axis, if the practice is profitable in terms of marginal costs and marginal revenues. (See previous explanation.) Whereas the previous set of production possibilities was PS, the new set (resulting from development of profitable crop, livestock or engineering practices) is now NS. A greater level of utility is guaranteed the farm family.

There is danger of an important oversight, however, in land grant college and USDA work. The production possibility curve can be raised by extension of those "nonmarket activities" along the horizontal axis as well as by practices that contribute to profit along the vertical axis. Suppose that techniques of farm practices are not changed at all but the "technology" of the other set of activities is. The latter might be brought about through new community organizations, information on how to participate in social organizations, psychological information to family members on how to understand themselves and each other in promoting family progress, better health and school facilities, an understanding of

the individual's role in and contribution to economic policy, and similar opportunities. Without changes in farm practices, the possibility curve is raised to PO by development of other activities. Indifference curve ID in figure 2A is tangent to both NS and PO, indicating that the level of family welfare can be increased equally by the family as by the practice avenue. (An indifference curve tangent to the "old" possibilities, PS, necessarily would represent a lower utility level than does ID.) Perhaps relatively too many of our educational and research resources have been devoted to pushing the curve *upward* from PS to NS, and too few in pushing it outward from PS to PO, when one as well as the other can contribute to increased farm family welfare. This statement has particular importance at the present when increases up the "practice" side have the main effect of increasing production and augmenting the "farm surplus" problem. Increases along the "family" side can add to welfare without the same implications in lowering farm prices and aggregate farm income.

Changing Values

A second set of curves also can be changed in slope. These are the indifference curves representing values. However, this can be a danger area for extension workers. Some few workers perhaps feel that their directive is to *change peoples' values* (i.e. the slopes of their indifference curves). (Some workers probably start out with a set of values they hope to impose on farm families.) This approach is for ministers and boy scout leaders, and not for economists. Whereas one can guarantee that if the slope of the production possibility curve is changed (e.g. as from PS to NS or PO in figure 2A) total satisfactions will be increased, he cannot change the slope of the indifference curve, unless the individual or family concerned selects the change. In other words the educational *expert* who "looks at the situation for a mountain farmer" in figure 1A, and says that he places too much value on coon hunting and leisure and not enough on profit, is saying that the set of indifference curves should have less slope than those shown. The *expert* who takes an opposite approach (and says the family is too profit minded and should plow more of their savings into family consumption or participate more in community affairs) is saying that the indifference curves should have greater slope. But to use the "flatter" or "steeper" curves, in specifying a plan for the family whose curves do not change, will result in a lowered family welfare (i.e. the point selected will be one where an indifference curve of the farm family intersects the possibility curve, although it is a point of tangency in terms of the values imposed by the extension worker).

The desired or proper approach is this: Farm families can be given greater information in respect to both the products they can purchase

with money (i.e. the profit axis of the figures) and the "nonmarket goods" or activities for which they can use their time, skills and facilities. They then may retain their old value systems or change to a new indifference map as they choose. Given all possible information about opportunities in consumption and living, neither change or lack of it can be indicated as *good* or *bad*. Benchmark studies that show lack of change in values need not reflect lack of progress in farm and home development programs, if ample information has been presented and farm families have not been coerced into accepting another set of values.

Breadth of Technological and Economic Choice Under Capital Variations

In many states, farm and home development programs are to provide educational services for all farmers but are attempting to emphasize beginning farmers, low-income farmers, or others who promise the greatest opportunity for progress. This development is indeed salutary and is long overdue. However, we believe that focusing emphasis on low-capital or low-income farmers will require relatively more emphasis on economics. The range over which purely technological farm practice information can improve the farmer's position is smaller as the amount of capital decreases. Briefly, we show one set of logic explaining why this is so.

At the outset we mentioned one historic assumption of extension education; that ample or unlimited capital is available. An auxiliary assumption has been that the main knowledge lack has been in technology (i.e. the greatest portion of funds has been allocated to biological and physical practices). Under these assumptions, the conclusion that the Pareto-better area is large and recommendations on farm practices alone can greatly increase the income of individuals in an atomistic environment is consistent. Although the assumptions and hence the conclusion can be questioned in terms of universal relevance, the framework followed can be illustrated as in figure 2B. Here it is supposed that the farmer starts at a low technological level (nonboundary) position for the given capital, and a low capital, level such as E_1. If we assume the farmer has unlimited capital available to him, he can move to a production possibility curve as high as AC, or higher. Under these assumptions, the Pareto-better area, in respect to using resources to maximize profits, is $E_1U_2U_3$. Any purely technological recommendation leading towards the arc denoted as U_2U_3 should lead to improved profits, if we view AC as being an attainable capital and production possibility level. One need not use or have knowledge of prices to be able to define a better use of resources as long as it falls in this quadrant. Any use of resources or

combination of products falling outside of this Pareto-better area must, however, use an economic (choice) criterion, such as prices. Now the Pareto-better area in respect to profit maximization is much smaller for a farmer with very limited funds who cannot move from point E_1 to the AC capital level. Curve LF can be used to represent the boundaries of production possibilities for such a farmer. The Pareto-better area now telescopes to $E_1R_2R_3$. But more important the proportion of plans whereby a technological recommendation alone will increase economic returns is much smaller for the low-capital-potential than for the high-capital-potential farmer. One proof of this is that the arc R_2R_3 represents a much smaller proportion of the possibility curve LF than does arc U_2U_3 for possibility curve AC. Accordingly, a much greater proportion of the opportunities open to low-capital-potential farmers require economic (choice) criteria or principles for specifying adjustments. The proportion of improvement that can come alone from farm practice recommendations is necessarily smaller than historically provided to the high-capital-potential farmer.

Further Development and Use of Fundamentals

In the brief space above we have tried to provide a basic or logical framework for farm and home development programs. The task is not completed but needs extension by others. Our own belief is that more time should be devoted to this type of activity before state programs go very far. We know, of course, that some states have given thought to these programs over a span of several years prior to their initiation. We also suspect that there are instances where the basic framework has not been carefully thought through. Field staff may be added without any systematic notion of what the total possibilities or the inherent dangers of farm and home planning programs really are. We would like to emphasize the need for further development of the fundamental framework. Time and space has required that we restrict our presentation to the technical or basic core of the framework. Translation of this fundamental logic into operational directives and procedures is the next step.

THE EFFECT OF FIXED AND VARIABLE COSTS ON KEEPING HIGH PRODUCING MILK COWS IN ISRAEL

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DAIRY cows in Israel are usually kept in barns, hand fed all the year round with green-fodder crops grown on irrigated fields, supplemented by vetch hay from unirrigated fields and rather large amounts of concentrates, only partly grown on the farm and mostly imported. The reason for keeping cows under such artificial and expensive conditions is that natural permanent pasture is nonexistent due to climatic circumstances. Although artificially irrigated permanent pastures are slowly increasing, green-forage crops in rotation produce higher yields per unit of area, a factor of decisive importance since land has formed the least available resource in Jewish colonization.

Under these circumstances costs of milk production consist of a larger proportion of fixed costs than in countries where cows are kept on natural permanent pasture. The high costs of feed production, hauling and distributing the feed in the barn tend to increase fixed costs. Fixed costs per unit of production quickly decrease with increasing yield, and the effect is more obvious to the farmer than the effect of rising costs with higher yields on account of diminishing returns. Until recently, imported concentrates enjoyed a favorable exchange rate which strengthened even more the tendency to apply large rations in order to get very high milk yields per cow.

The research by Einar Jensen[1] established beyond doubt that in milk production the law of variable proportions is in force, especially for cows with very high milk yields. This law is more significant where variable costs form higher proportions than where fixed costs are by far the most important. Therefore, it is not surprising that the tendencies for fixed costs to decrease and variable costs to increase with rising yield are not equally well understood by farmers in countries with different production conditions and different sets of costs schemes. In the United States more stress is laid on the importance of variable proportions whereas in Israel the importance of fixed costs is emphasized. Obviously both tendencies have to be considered at once in order to establish the point of minimum costs under specific conditions.

[1] Einar Jensen, *Input-Output Relationships in Milk Production*, USDA Tech. Bul. 815, 1942

Cost Scheme of Milk Production in Israel

Fixed costs

Costs of production vary over wide ranges in Israel due to extremely varying conditions of water prices from one district to the other, of labor costs in older and younger settlements, of prices of milk cows raised on the farm or imported, etc. Without trying to establish anything like "average" costs, three different sets of fixed costs were taken in the proportion of, roughly, 100 : 120 : 140 in order to illustrate the effect of price changes on the minimum cost of milk production.

Table I shows the physical input and the expenditure of fixed costs at different price levels.

TABLE 1. FIXED ANNUAL COSTS PER MILK COW[1]

Price Set:	A	B	C
Maintenance Feed: 15 tons Green Forage, 1.6 tons Vetch Hay	$162	$196	$230
Labor: Feeding, Caring, Cleaning 15 man-days	50	58	67
Miscellaneous: Depreciation of Buildings and Implements, Bull-Service, Veterinary, Insurance, Medicines, Bedding	64	78	92
Management, Interest on Investments & on Revolving Fund	78	89	100
Total	354	421	489
Less: Income from Young Stock & from Manure	39	47	56
Costs on Account of Milk	315	374	433

[1] Costs in Israel Pounds converted into Dollars at the official exchange rate of IL 1.800—$1.—

Depreciation of the milk cow

The annual depreciation of the milk cow depends on the value of the young cow against the price received from the butcher for a culled cow or from the insurance company in case of her death, divided by her productive life. Taking into account a higher initial value of the high producing milk cow and her short production period in relation to a cow

TABLE 2. DEPRECIATION OF THE MILK COW IN DOLLARS PER YEAR

Annual Milk Yield in lbs. per year	Price Set: A	B	C
6,600	$28	$33	$39
7,700	33	40	47
8,800	39	47	54
9,900	44	53	62
11,000	50	60	70
12,100	56	67	78
13,200	61	73	86

producing less, we may assume increasing costs of annual depreciation with increasing milk yield. In addition, variations of depreciation costs were introduced just as those for fixed costs in order to measure their influence on total costs.

Other variable costs

The feed required for milk production is calculated in lbs. T.D.N. taking into account the law of variable proportions, according to the results obtained in the experiments of Einar Jensen.

TABLE 3. FEED REQUIREMENTS AND FEED SUPPLY IN LBS. T.D.N.

Annual Milk Yield	Feed Requirements			Feed Supply	
per cow	Maintenance	Production	Total	Basic Feed	Additional Feed for milk production
lbs.	lbs. T.D.N.	lbs. T.D.N.	lbs. T.D.N.	lbs. T.D.N.	lbs. T.D.N.
6,600	2,400	1,900	4,300	3,000	1,300
7,700	2,400	2,300	4,700	3,000	1,700
8,800	2,400	2,700	5,100	3,000	2,100
9,900	2,400	3,300	5,700	3,000	2,700
11,000	2,400	4,050	6,450	3,000	3,450
12,100	2,400	5,000	7,400	3,000	4,400
13,200	2,400	6,200	8,600	3,000	5,600

Three different sets of prices, namely $35, $52, and $70 per 1,000 lbs. T.D.N. were supposed. The wide range applied in this case reflects approximately the actual difference in price as existing between (A) farms producing their own grain, (B) farms buying all their concentrates on the market at the previous exchange rate for imported feed (IL.1 = $1), and (C) the change brought about by the new exchange rate (IL.1.800 = $1) on the price of imported feeding stuffs.

TABLE 4. COST OF PRODUCTION FEED

Annual Milk Yield per Cow lbs.	Production Feed lbs. T.D.N.	Price in Dollars per 1000 lbs. T.D.N.		
Price Set:		A $ 35	B $ 52	C $ 70
6,600	1,300	$ 45.5	$ 67.6	$ 91.0
7,700	1,700	59.5	88.5	119.0
8,800	2,100	73.5	109.2	147.0
9,900	2,700	94.5	140.4	189.0
11,000	3,450	120.8	179.4	241.5
12,100	4,400	154.0	228.8	308.0
13,200	5,600	196.0	291.2	392.0

Labor requirements for hand milking are figured according to the rising milk yield and using labor costs of $3.30, $3.90 and $4.50 respectively per man-day. Dairy enterprises in Israel are almost exclusively worked by settler families without hired workers so that labor costs are determined by the costs of living of the settlers. These costs vary, dependent mainly on the family size and the standard of living, set A representing young families in newly established farms, set B medium costs, and set C the high costs of older settlements with large families and higher standards of living.

TABLE 5. ANNUAL LABOR COSTS FOR HAND-MILKING IN DOLLARS PER COW

Annual Milk Yield per Cow lbs.	Labor man-days	Costs per Man-Day		
		Price Set: A $ 3.30	B $ 3.90	C $ 4.50
6,600	12.5	$41.25	$48.75	$56.25
7,700	14.6	48.81	56.94	65.70
8,800	16.6	54.78	64.74	74.70
9,900	18.7	61.71	72.93	84.15
11,000	20.9	68.97	81.51	94.05
12,100	24[1]	79.20	93.60	108.00
13,200	28[1]	92.40	109.20	126.00

[1] Cows with very high milk yields require more labor for care than those with lower production. This additional labor was added here, under variable costs.

Total costs per pound of milk

Summing up the different cost items and converting them into costs per pound, we arrive at the following scheme: (See also Graph 1)

TABLE 6. COST PER LB. OF MILK IN CENTS

Annual Milk-Yield per cow lbs.	Price Set: A			B			C		
	Fixed Costs ¢	Variable Costs ¢	Total Costs ¢	Fixed Costs ¢	Variable Costs ¢	Total Costs ¢	Fixed Costs ¢	Variable Costs ¢	Total Costs ¢
6,600	4.7	1.8	6.5	5.7	2.2	7.9	6.6	2.8	9.4
7,700	4.1	1.8	5.9	4.9	2.4	7.3	5.7	3.0	8.7
8,800	3.6	1.9	5.5	4.3	2.5	6.8	4.9	3.2	8.1
9,900	3.2	2.0	5.2	3.8	2.7	6.5	4.4	3.4	7.8
11,000	2.9	2.2	5.1	3.4	2.9	6.3	3.9	3.7	7.6
12,100	2.6	2.4	5.0	3.1	3.2	6.3	3.6	4.1	7.7
13,200	2.4	2.6	5.0	2.8	3.6	6.4	3.3	4.6	7.9

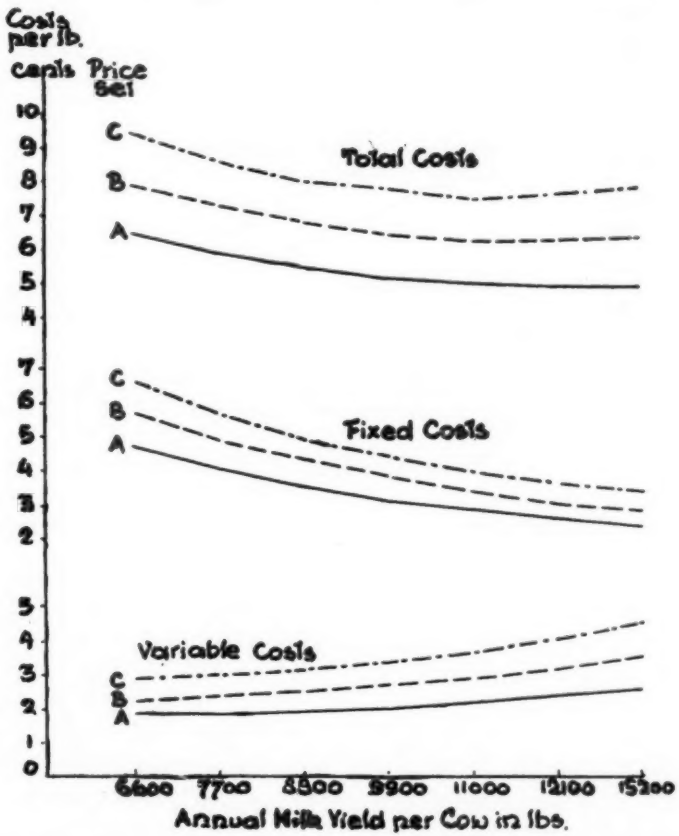
The point of minimum cost is reached under Price Set A between 12,000 and 13,000 lbs., under Price Set B at around 12,000 lbs. and under Price Set C between 11,000 and 12,000 lbs. per cow. This becomes still more evident when comparing cost increments with rising milk yields (See also Graph 2)

TABLE 7. COST INCREMENTS WITH RISING MILK YIELDS IN CENTS

Annual Milk Yield rising from lbs. to lbs.	Price Set: A				B				C			
	Fixed Costs Decr. ¢	Var. Costs Incr. ¢	Total Costs Decr. ¢	Total Costs Incr. ¢	Fixed Costs Decr. ¢	Var. Costs Incr. ¢	Total Costs Decr. ¢	Total Costs Incr. ¢	Fixed Costs Decr. ¢	Var. Costs Incr. ¢	Total Costs Decr. ¢	Total Costs Incr. ¢
6,600– 7,700	0.6	0.0	0.6	—	0.8	0.2	0.6	—	0.9	0.2	0.7	—
7,700– 8,800	0.5	0.1	0.4	—	0.6	0.1	0.5	—	0.8	0.2	0.6	—
8,800– 9,900	0.4	0.1	0.3	—	0.5	0.2	0.3	—	0.5	0.2	0.3	—
9,900–11,000	0.3	0.2	0.1	—	0.4	0.2	0.2	—	0.5	0.3	0.2	—
11,000–12,100	0.2	0.2	0.0	—	0.3	0.3	0.0	—	0.3	0.4	—	0.1
12,100–13,200	0.2	0.2	0.0	—	0.3	0.4	—	0.1	0.3	0.5	—	0.2

The Influence of Milk Prices on "Greatest Return" Yields

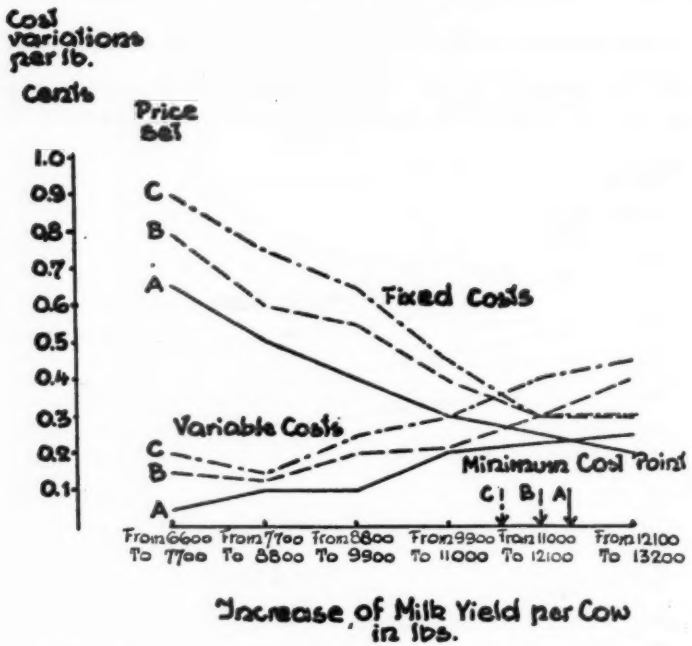
It is not the purpose of this article to establish the minimum price for milk that must be paid to the farmer in Israel in order to make the dairy



GRAPH 1. VARIABLE, FIXED AND TOTAL COSTS OF MILK PRODUCTION AT DIFFERENT YIELDS AND PRICES.

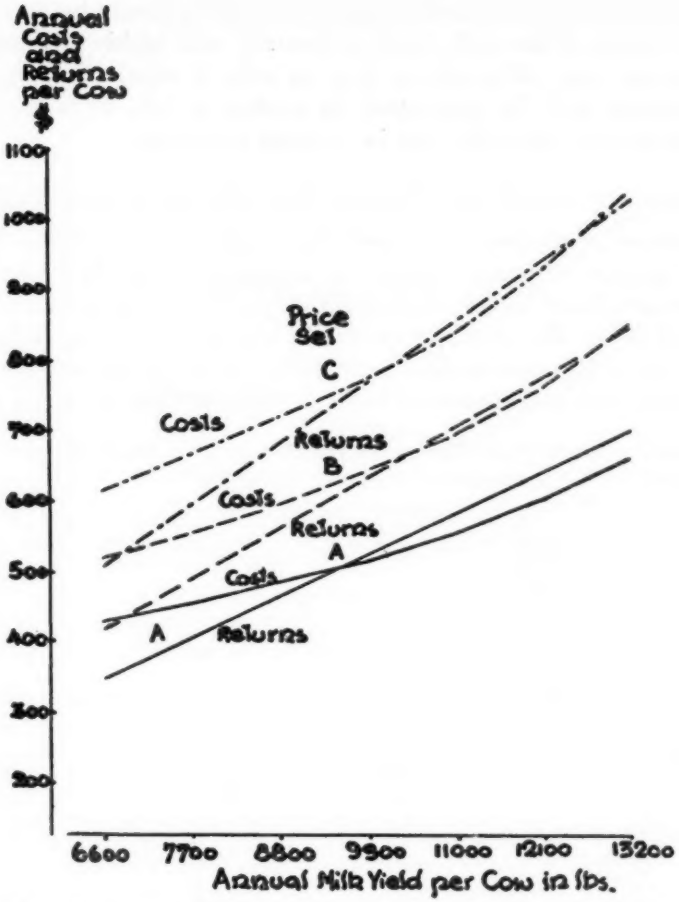
branch profitable. The author accepted the formula used by the Milk Producers Association for current feeding practices, labor input, etc., without going into detail about possibilities of cutting costs through better management. The only purpose is to show how very high milk yields may affect costs of production adversely and to determine the point of minimum costs under widely varying price and cost conditions.

In Graph 3, three different milk prices: 5.3¢, 6.4¢ and 7.7¢ per lb. are compared with the three different price sets applied above.



GRAPH 2. COST INCREMENTS WITH RISING YIELD UNDER VARYING CONDITIONS.

At a price of 5.3 cents per lb. there remains a net return starting with cows of 9,900 lbs. and continuing up to 13,200 lbs. although the minimum cost point is reached at approximately 12,000 lbs. At this price only producers with comparatively low costs as supposed in Price Set A could succeed. In effect, lowest costs of maintenance and feed are usually combined in Israel with higher costs of labor. This is due to the fact that the old established settlements with higher labor costs are the ones that made their investments in former years at lower price levels and that have most experience and skill. It should be stressed, however, that our calculation of fixed costs in Price Set A is based on rather high feeding costs that can be lowered with an increasing ration of the cheaper green fodder instead of the more expensive hay.



GRAPH 3. ANNUAL COSTS AND RETURNS PER COW AT DIFFERENT PRICES.

At a price of 6.4 cents per lb. producers under Price Set B conditions would make a profit starting from 11,000 lbs. annual milk production per cow and continuing up to slightly above 12,000 lbs. A milk yield of 13,000 lbs., however, would result in a small loss.

At a price of 7.7 cents per lb. even producers under Price Set C conditions would be able to stay in business with cows yielding 11,000 to 12,000 lbs. Maximum profit is reached at a yield of 11,000 lbs. A milk yield of 13,000 lbs., however, would result in a loss of $20 per cow.

The conclusion from these calculations is that with the specific cost pattern of milk production in Israel, minimum costs are generally reached at high levels of yield within the range of 10,000 to 12,000 lbs. per cow. To force milk yields up beyond this range does not ordinarily pay.

(Another reason for abstaining from record yields should be the fact that the fat content of the milk tends to decrease with highly increasing production per cow. Although as long as milk is mostly used for drinking purposes and the prescribed fat content is low, as is the case in Israel at present, this factor may be of minor importance.)

Comparison of Price Pattern Between Hand-Fed and Pastured Milk Cows

If natural conditions were such that milk cows could be kept on natural permanent pasture instead of keeping them all the year round in the barn and hand feeding them with fodder from cultivated and mostly irrigated fields, the cost pattern would change decisively. This would express itself in considerably lower costs for the basic feed ration, for fixed labor costs and somewhat lower costs for management and interest.

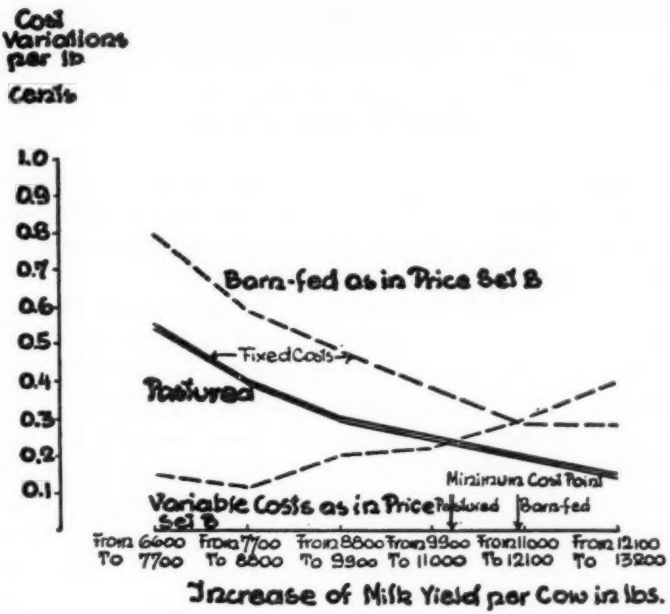
TABLE 8. COSTS OF MILK PRODUCTION ASSUMING NATURAL PERMANENT PASTURE

Fixed Costs	Cost per Cow
Maintenance Feed	$ 95
Labor, 9 man-days	35
Other fixed costs	140
Total Fixed Costs	270
Less: Income from Young Stock (but less from manure)	35
Costs on Account of Milk	235

Annual Milk Yield	Costs per lb. of Milk		
lbs.	Fixed Costs ¢	Variable Costs ¢	Total Costs ¢
6,600	3.6	2.2	5.8
7,700	3.1	2.4	5.5
8,800	2.7	2.5	5.2
9,900	2.4	2.7	5.1
11,000	2.1	2.9	5.0
12,100	1.9	3.2	5.1
13,200	1.8	3.6	5.4

TABLE 9. COST INCREMENTS WITH RISING MILK YIELDS

Annual Milk Yield rising		Fixed Costs	Variable Costs	Total Costs	
from	to	Decr.	Incr.	Decr.	Incr.
lbs.	lbs.	¢	¢	¢	¢
6,600–	7,700	0.5	0.2	0.3	—
7,700–	8,800	0.4	0.1	0.3	—
8,800–	9,900	0.3	0.2	0.1	—
9,900–	11,000	0.3	0.2	0.1	—
11,000–	12,100	0.2	0.3	—	0.1
12,100–	13,200	0.1	0.4	—	0.3



GRAPH 4. COST INCREMENTS WITH RISING YIELD AT DIFFERENT COST PATTERN

Assuming that all other factors remain unchanged, as given under Price Set B, we arrive at the following calculation: (See Graph 4).

Graph 4 shows clearly that the point of minimum costs moves to the left and the least-cost combination will be reached at approximately 11,000 lbs. instead of the 12,000 lbs. under the provisions previously made under Price Set B.

This result seems to confirm the initial statement that under conditions of natural permanent pastures farmers are inclined to pay more attention to the law of variable proportions than under conditions of expensively grown feed from irrigated fields. The latter are justified in trying to reach higher yields, although even in this case there is a definite limit beyond which costs start to increase. This limit is—except under unusually low costs of production and high prices for milk—lower than many farmers are inclined to assume.

A PARTIAL INDIFFERENCE SURFACE FOR BEEF AND PORK

FREDERICK V. WAUGH[1]
Agricultural Marketing Service

THE immediate aim of this study was to derive an indifference surface for beef and pork. A broader aim was to explore a possible method of deriving an indifference surface for any pair of goods, using data on prices, consumption, and consumer income.

This matter obviously is important to economists. Such modern writers as Hicks[2] base the whole theory of demand upon indifference surfaces. But they do not attempt to present actual surfaces, derived from statistical data. Instead, they assume hypothetical surfaces to illustrate pure theory. This serves the same purpose as Marshall's[3] famous hypothetical demand schedule for tea. Since the days of Marshall, economists and statisticians have derived hundreds of demand curves from market data. We now have useful statistical estimates of the price elasticities and income elasticities of demand for a wide variety of goods in many countries. These statistical estimates are essential in any practical, quantitative application of demand theory. If indifference analysis is to be used as the basis for recommendations in the real world, we must have similar quantitative estimates of actual indifference surfaces.

I shall first discuss in some detail the statistical analysis used to estimate beef-pork price ratios. I shall present two surfaces (or "contour maps") that describe variations in these price ratios. At the end of the paper I shall try to justify the use of one of these surfaces as an approximation to a partial indifference surface.

The word "partial" is used here in the same sense as in the term "partial demand curve." Specifically, the partial indifference surface to be presented was obtained (1) by analyzing price ratios adjusted to allow for the effects of changing consumer incomes, and (2) by neglecting the separate effects of the thousands of individual goods that compete for the consumer's dollar. This is similar to most statistical work on the demand for particular goods. Commonly, the demand curve is adjusted for changes in consumer income. And usually the effects of most other goods are neglected.

[1] The author gratefully acknowledges helpful suggestions from Prof. Kenneth W. Meinken, of Rutgers University, and from his colleagues in AMS, Glenn L. Burrows, Anthony S. Rojko, and Harold F. Breimyer. Also, he thanks Mrs. Martha N. Condee, who made the computations.

[2] J. R. Hicks, *Value and Capital*, Oxford, 1939.

[3] Alfred Marshall, *Principles of Economics*, London, 8th edition, 1930, p. 96.

The Data

The study is based upon the data exhibited in Table 1.

We shall not discuss in detail the accuracy of these data. They are all estimates, and all subject to some error. But much experience with these particular estimates indicate that they are reliable enough for the statistical analysis we have in mind.

The pre-World War II period, 1932-1941, was chosen because it was the most recent decade in which there was a stable relationship between

TABLE 1. THE DATA

Year	Per capita consumption[1] (pounds)		Average retail prices[2] (cents per pound)		Price ratio	Disposable income per capita[3] (dollars)
	beef q_1	pork q_2	beef p_1	pork p_2	r	y
1932	46.0	69.7	24.9	15.6	1.596	378
33	50.8	69.8	21.5	13.9	1.546	355
34	63.0	63.6	23.3	18.8	1.239	403
35	52.5	47.7	30.5	27.4	1.113	449
36	59.7	54.4	28.6	26.9	1.063	509
37	54.4	55.0	32.5	27.7	1.173	544
38	53.6	57.4	28.7	24.5	1.171	497
39	53.9	63.9	29.5	22.2	1.329	529
1940	54.2	72.4	29.5	19.3	1.528	565
41	60.0	67.4	31.5	24.7	1.275	680

[1] Agricultural Marketing Service.
[2] Bureau of Labor Statistics, U. S. averages.
[3] Department of Commerce.

meat prices, meat consumption, and consumer income. The World War II period is unsatisfactory, since rationing and price control distorted the normal demand situation. A postwar period would be more useful, but the postwar period is not yet long enough to give us results that are statistically significant.

Graphic Analysis of Price Ratios

For the present, we can forget that our main purpose is to derive an indifference surface. Our first step is to explain (or predict) the ratios between beef prices and pork prices.

One way to do this is illustrated in Figure 1.

The data for each year are first plotted. Take 1932, for example. The per capita consumption data were: for beef, 46.0 pounds, and for pork, 69.7 pounds. This combination of beef and pork is located by measuring 46.0 units along the x-axis and 69.7 units along the y-axis. (See the dot labeled '32.) Through this dot we have drawn a straight line. The slope

of this line is the negative of the price ratio, or −1.596. Data for the other nine years are plotted in the same way. Each dot shows a combination of beef and pork consumed in some year. Each straight line through the dot shows the negative of the price ratio for that year.

Suppose now that we want to estimate the expected price ratio associated with any given combination of beef and pork. One way to do this is to draw a family of curves like those shown in Figure 1. A curve is

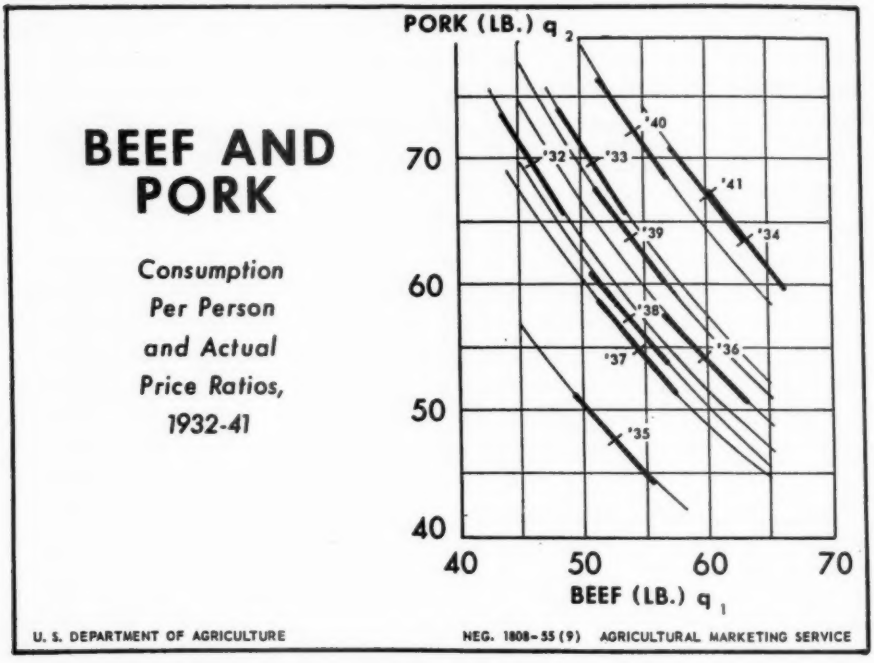


FIG. 1

drawn through each dot (except that we have assumed that the observations for 1934 and 1941 lie approximately on the same curve). Each curve is drawn approximately tangent to the straight line at the point indicated by the dot. The family of curves is similar to a set of contour lines on a map, although the heights of elevation are not indicated. We assume a regular, smooth surface. In drawing any single curve, we keep in mind not only the slope of the surface at one point, but at all other points. We do not allow any pair of curves to cross one another.

The family of curves shown in Figure 1 fits the data remarkably well. The slope of each curve is almost exactly equal to the slope of the straight line at the point of tangency. In other words, the family of curves gives good estimates of the actual price ratios in each of the ten years. It could

be used to estimate the ratios to be expected from other combinations of beef and pork. For example, what price ratio would have been expected if the per capita consumption of beef and pork had each been 60 pounds? We interpolate a new line in between that for 1933 and that for 1940. The slope of this line at the point $q_1 = 60$, $q_2 = 60$ is about -1.24. So the expected price ratio is $p_1/p_2 = 1.24$, beef costing 1.24 times as much as pork. (Note: q_1, q_2, p_1, and p_2 are defined in Table 1.)

Least-squares Estimates of Price Ratios

The graphic analysis illustrated by Figure 1 gives a good basis for estimating the price ratios associated with various combinations of beef and pork. But the curves in Figure 1 do not necessarily describe an indifference surface. They would do so only if the consumption of all other goods and services had remained constant throughout the period. Actually, of course, other things were not constant. *Per capita* incomes rose, both in money and in real terms.

To get around this difficulty, we shall adjust the actual price ratios for changes in *per capita* incomes. In other words, we first shall estimate what the price ratios would have been if *per capita* income had remained constant throughout the period; then we shall derive an indifference surface that is consistent with the adjusted price ratios.

Originally I started with two least-squares demand equations: one to estimate beef prices, the other to estimate pork prices. Although my correlations were high, the price flexibilities were not consistent with those found in most other studies. So I prefer to start with a single least-squares equation to estimate the price ratio, r. That equation is

$$(1) \qquad \log r = 0.130 - \underset{(\pm 0.138)}{0.628} \log q_1 + \underset{(\pm 0.083)}{0.853} \log q_2 - \underset{(\pm 0.062)}{0.072} \log y.$$

The numbers in parentheses are standard errors of regression coefficients. The multiple correlation coefficient was 0.982.

The regression coefficients in (1) are roughly consistent with those obtained by Foote and Fox.[4] By taking the difference between their equations (5.1) and (6.1), their coefficient of log q_1 would be -0.77, compared to my -0.628. Their coefficient of log q_2 would be $+0.82$, compared to my $+0.853$. Their coefficient of log y would be -0.07, compared to my -0.072. My equation (1) is not inconsistent with the findings of many previous studies that the demand for beef and pork are both slightly inelastic, and that the cross-elasticities are positive and approximately equal.

[4] R. J. Foote and Karl A. Fox, *Analytical Tools for Measuring Demand*, Agricultural Handbook No. 64, U.S.D.A., Jan. 1954, p. 16.

The coefficient of multiple correlation is 0.982, indicating that equation (1) gives very accurate estimates of the price ratios (actual and estimated ratios are shown in Table 2). The last regression coefficient in (1) is not significant. This means that within the range of observed data consumer incomes had no significant effect upon the price ratios. For that reason the family of curves in Figure 1 fit the data very well without adjusting the price ratios for income variations. But, although the last coefficient happens to be nonsignificant in this case, we shall use (1) as our best estimate of the price ratios.

The Mathematics of Contour Lines

Figure 2 differs from Figure 1 in three ways. First, in Figure 2 we have plotted "adjusted" price ratios by allowing for the effect of changes in consumer income. Second, the contours in Figure 2 were derived mathematically while the contours in Figure 1 were drawn graphically. Third, Figure 2 is labeled a "partial indifference surface." I hope to justify that labeling in the final section of this paper. For the present, we can think of Figure 2 only as a means of estimating the adjusted price ratios.

The adjusted price ratios, r′, are estimates of the ratios that would

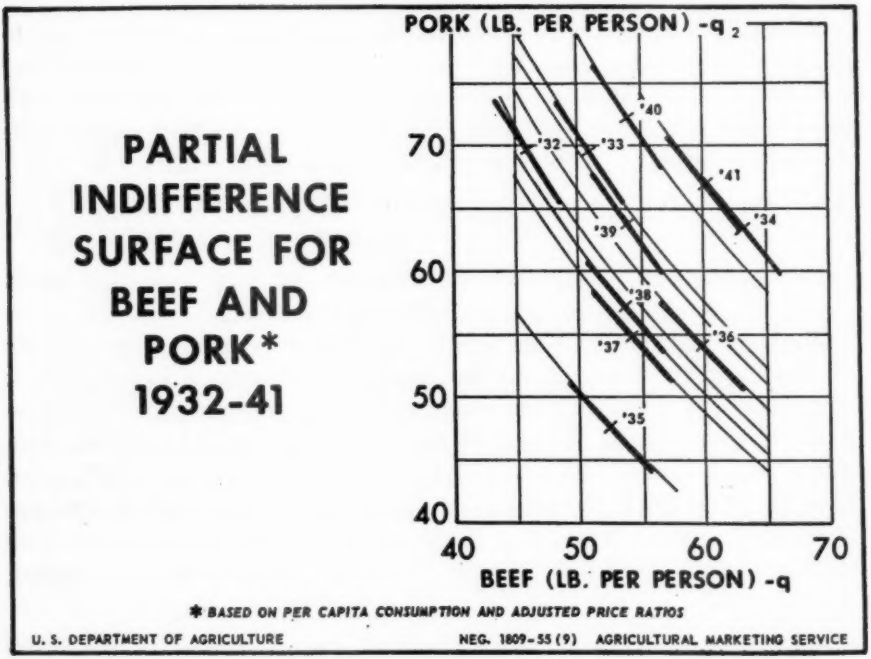


FIG. 2

have occurred if per capita disposable income had remained constant at \$490.90, the average of the period. In making this adjustment, we use the last coefficient in equation (1). Specifically, the adjusted price ratios were computed from

$$(2) \qquad \log r' = \log r + 0.072 (\log y - \log 490.90)$$
$$= \log r + 0.072 \log y - 0.194.$$

We use (2) to compute an adjusted ratio, r', for each year. We then need an equation for estimating the expected r' associated with varying amounts of beef and pork. Such an estimating equation can be obtained by letting y = 490.90 in equation (1). This gives us the estimating equation

$$(3) \qquad \text{est. } \log r' = -0.324 - 0.628 \log q_1 + 0.853 \log q_2.$$

This is the equation to use in estimating what the price ratios would have been if per capita income had remained constant at \$490.90.

Table 2 exhibits the actual and adjusted price ratios, and also the estimated actual ratios from equations (1) and the estimated adjusted ratios from equation (3).

To pass from the price ratios to a partial indifference surface, we want the equation of a surface, the contours of which will be consistent with (3). That is, the slope of a contour at any point must be r', as estimated by equation (3).

Consider, more generally, any equation of the form

$$(4) \qquad r = a\, q_1^{\,b}\, q_2^{\,c},$$

TABLE 2. PRICE RATIOS

Year	Price ratios, $r = p_1/p_2$			
	Actual ratio, r	Estimated ratio,[1] est. r	Adjusted ratio,[2] r'	Estimated adjusted ratio,[3] est. r'
1932	1.596	1.625	1.567	1.597
33	1.546	1.536	1.511	1.502
34	1.239	1.228	1.222	1.212
35	1.113	1.069	1.107	1.063
36	1.063	1.093	1.066	1.097
37	1.173	1.164	1.183	1.174
38	1.171	1.227	1.173	1.229
39	1.329	1.334	1.337	1.342
1940	1.528	1.471	1.545	1.488
41	1.275	1.281	1.306	1.313

[1] Unadjusted ratios computed from equation (1).
[2] Adjusted ratios computed from equation (2).
[3] Estimated adjusted ratios computed from equation (3).

and let Z represent the elevation of a surface. If we let

$$Z = a \frac{(1-c)}{1+b} q_1^{1+b} + q_2^{1-c}, \tag{5}$$

the contours of Z will have the correct slopes at all points. Thus the slope of the contours of Z in (7) at any point is

$$\frac{\partial Z}{\partial q_1} \Big/ \frac{\partial Z}{\partial q_2} = a\, q_1^{b}\, q_2^{c}, \tag{6}$$

the same as in (6).

Equation (5) was suggested to me by my colleague, Glenn L. Burrows. It is not the only equation that would give the proper contour lines. Any such equation as

$$Z^* = k_1 + k_2 Z^{k_3}$$

would provide exactly the same contour lines as Z. That is, by taking partial derivatives of Z^*, it can be shown that

$$\frac{\partial Z^*}{\partial q_1} \Big/ \frac{\partial Z^*}{\partial q_2} = \frac{\partial Z}{\partial q_1} \Big/ \frac{\partial Z}{\partial q_2}$$

We do not insist here upon a unique solution of the surface. Any surface that gives the correct contours will do for our purpose.

Equation (3) is equivalent to

$$r' = 0.474\, q_1^{-0.628}\, q_2^{0.853} \tag{7}$$

Thus, (5) shows that a satisfactory surface is

$$Z = \frac{(0.474)\ (0.147)}{0.372} q_1^{0.372} + q_2^{0.147} \tag{8}$$
$$= 0.187\, q_1^{0.372} + q_2^{0.147}$$

To calculate the contour in Figure 2 associated with any specific year, we first calculate the value of Z for that year, say Z_t, where

$$Z_t = 0.187\, q_1^{0.372} + q_2^{0.147}$$

Then the equation of the contour line through year t is

$$q_2 = [Z_t - 0.187\, q_1^{0.372}]^{6.80272} \tag{9}$$

In preparing Figure 2, we used (8) and (9) to calculate several points on each contour line (specifically the values of q_2 associated with q_1 = 45, 50, 55, 60, and 65).

The data are plotted in Figure 2 as in Figure 1. The only difference is that the slopes of the heavy straight lines in Figure 2 represent the adjusted price ratios, r', while in Figure 1 they represented the actual ratios, r.

Figure 2, like Figure 1, shows only one contour for the two years 1934

and 1941. The contour shown is that for 1934. Both contours were calculated. That for 1941 was very slightly higher than that for 1934. But they were so nearly the same that the two lines could not be distinguished in the diagram.

In general, the calculated contour lines in Figure 2 fit the adjusted ratios very well. That is, each contour line is approximately tangent to the adjusted-price-ratio line at the point of observation (indicated by the dot). The closeness of fit can be seen also by comparing the last two columns of Table 2.

But, as in all statistical work, the fit is not perfect. As shown in Table 2, for example, the adjusted ratio for 1938 was 1.173, while the estimated adjusted ratio for that year was 1.229. This was the poorest estimate in the series—i.e. the largest discrepancy between the actual and estimated adjusted ratios. This discrepancy is indicated in Figure 2 by the fact that the contour line through the 1938 observation is not tangent to the price ratio line, but crosses it.

Yet the errors made in estimating the adjusted price ratios from equation (3) are, in general, very small. They are the same as the errors made in estimating the ratios from the contour lines in Figure 2. This is because the contour lines in Figure 2 were derived from equation (3). The errors of estimate may be due to neglecting the effects of individual commodities other than beef and pork, to errors in the original data, to the failure of equation (2) to represent a true functional relation, or to small changes in consumer preferences during the ten-year period.

I do not believe that the small errors of estimate need concern us in this case. In fact, we should have been suspicious if all the estimates had been absolutely accurate. The contours in Figure 2 are statistical approximations, and very good ones.

Is Figure 2 an Indifference Surface?

So far, I have postponed the $64 question. I have discussed price ratios and contour lines. Now I propose to argue that the contour lines in Figure 2 represent a statistical approximation to a partial indifference surface.

Before getting into the meat of the argument, though, I shall try to clarify two matters of concept or definition.

The first matter is the concept of a partial indifference surface. This was discussed very briefly in the introduction to this paper. A complete indifference surface would have as many dimensions as the number of goods and services available to consumers—probably several thousand dimensions in modern society. Figure 2 is two-dimensional. It obviously is not a complete indifference surface. There are no dimensions for lamb, chicken, potatoes, newspapers, movie tickets, or for the hundreds of other

goods and services available. We have directed our attention to two dimensions only, representing quantities of beef and pork. All other goods and services (including savings) are lumped together under consumer income. We could imagine a three-dimensional diagram: the dimensions being the quantity of beef, the quantity of pork, and an index of the quantity of all other goods and services. In a sense, Figure 2 is a cross section of such a three-dimensional surface, holding per capita income constant at $490.90.

As consumer incomes vary, the indifference surface for beef and pork varies too. Our analysis measures only a community indifference function for beef and pork at stated levels of money income. Our analysis would allow us to predict a consumer's position on the indifference surface, if the quantities of beef and pork, and the income were given. My colleague, Anthony S. Rojko, points out that if the prices of beef and pork, and the income were given the solution would be indeterminate. This can be seen graphically in Figure 2. If the two quantities are given, they determine a position on the indifference map. But if the prices are given, they determine only the slope—which might be in any number of positions.

The second concept that requires some discussion is that of a community indifference surface. The wants and preferences of different individuals may be quite unlike. Our analysis is based upon average *per capita* figures. An indifference surface based upon such figures is often called a community indifference surface. Imagine an individual whose preferences (other than those changes that could be explained by income were constant from 1932 through 1941, and who actually bought in each year the quantities of beef and pork shown in Table 1. Figure 2 would be the indifference surface for such an individual.

I now propose to argue that Figure 2 is an approximate indifference surface for a typical consumer (or, if you prefer, an approximate community indifference surface). The argument rests upon three points.

1. *The observed data are statistically consistent with the hypothesis that Z in equation (8) is a monotonic function of utility, say* $Z = \emptyset(U)$.

To quote Hicks[5] again, "If an individual is in equilibrium with respect to a system of market prices, it is directly evident that his marginal rate of substitution between any two goods must equal the ratio of their prices." The marginal rate of substitution (or the slope of a contour line at any point in Figure 2) is

$$\frac{\partial Z}{\partial q_1} \Big/ \frac{\partial Z}{\partial q_2} = \frac{\partial[\emptyset(U)]}{\partial q_1} \Big/ \frac{\partial[\emptyset(U)]}{\partial q_2}$$

[5] Hicks, *op. cit.*, p. 20.

But we have already proved that

$$\frac{\partial Z}{\partial q_1} \Big/ \frac{\partial Z}{\partial q_2} = \text{est. } r',$$

where est. r′ is the estimate given by equation (3).

2. *The contour lines in Figure 2 are the only set of indifference lines consistent with equations (1) and (8) and with the theory of rational consumer choice.* We are not assuming here that Z is a measure of utility. Any monotonic function of Z will give the same set of contour lines. But any function f (q_1, q_2) that is not a monotonic function of Z will give different contour lines. These will not be consistent with equations (1) and (3). Therefore, if (1) and (3) are taken as adequate statistical measures of the beef-pork price ratio, we must conclude that the contour lines in Figure 2 describe the only indifference surface that is consistent with our statistical results and with the assumption of rational consumer choice.

3. *Equations (1) and (3) fit the data remarkably well as indicated by high correlations and relatively low standard errors.* If equations (1) and (3) were absolutely accurate, the indifference surface in Figure 2 would also be absolutely accurate.

Before concluding this paper, I should mention one more comment of Hicks[6] that may seem to cast doubt upon the validity of my conclusions:

"The indifference diagram, measuring its two 'commodities' along its two axes, is only useful when the consumer can be thought of as spending his income upon two 'commodities' and two 'commodities' only; this usually means in practice, that it must be applied to the case in which we are interested in problems of demand for one physical commodity, and measure along the other axis all other commodities lumped together (Marshall's *money*). For these problems—Marshall's problems—the indifference diagram is very instructive, and enables us to put a keener edge on the analysis than is possible by Marshall's methods. But the problem of related goods cannot be treated on a two-dimensional indifference diagram. It needs three dimensions to represent two related goods and *money* (the necessary background)."

The above quotation is from Hicks' discussion of complementarity. At least a part of his argument is that a two-dimensional indifference surface does not give us a measure of the degree of complementarity, or of competitiveness. This, I believe, is correct. The relative flatness of the indifference lines in Figure 2 suggests that beef and pork are competitive; but gives no quantitative measure. If we wanted such a measure, we might compute the "elasticity of substitution."[7] But I doubt that the

[6] Hicks, *op. cit.*, p. 45.

[7] See R. G. D. Allen, *Mathematical Analysis for Economists*, London: Macmillan, 1938, pp. 341-343, and Irving Morrissett, "Some Recent Uses of Elasticity of Substitution," *Econometrica*, Vol. 21, No. 1, 1953, p. 48.

computation" of such an elasticity is worthwhile in this case. We know, of course, that beef and pork compete with each other.

As to Hicks' argument that we need at least three dimensions (representing two goods and money), we have considered three dimensions in our analysis. Essentially, Figure 2 is a cross section of a three-dimensional surface, holding consumer income constant at $490.90.

I believe that this view is in line with another quotation from Hicks:[8]

"When expenditure is distributed between more than two goods, the indifference diagram loses its simplicity; for three goods we need three dimensions, and for more than three goods geometry fails us altogether. However, the principles which we have established in this chapter remain substantially unaffected. The marginal rate of substitution can be defined as before with added proviso that the quantities consumed of all other commodities (Z . . .) must remain unchanged."

We cannot actually hold all other individual commodities unchanged, but we have (in a sense, at least) held money incomes unchanged.

Finally, it is interesting to note that the indifference lines in Figure 2 are remarkably similar to the contour lines in Figure 1. A diagram like Figure 1 was recently published,[9] and labeled "indifference curves." I stated in the publication that a diagram like Figure 1 was an approximation to an indifference surface "if the income elasticities for two goods are approximately equal." Also, I stated that "I hope to discuss this problem in more detail elsewhere and to justify the method illustrated by this example."

I now believe that the contours in Figure 1 are not conceptually the same as indifference curves. I believe that the contours in Figure 2 do qualify as statistical approximations to partial indifference curves. But in this case the two sets of contours are almost identical (so nearly so that the draftsman questioned that both Figure 1 and Figure 2 were needed). For practical purposes, either set of contours is a good approximation to a partial indifference surface.

The reason the two sets of contours are nearly the same is that the elasticity of the price ratio with respect to income in equation is small and not statistically significant. Because of this, the adjusted price ratios, r', differ very little from the actual price ratios, r. Although that is true in this particular case, it would not be generally true of any pair of goods. In the general case, we need to correct the price ratios for income effects, as we have done in Figure 2.

[8] Hicks, *op. cit.*, p. 24.

[9] Frederick V. Waugh, *Graphic Analysis in Economic Research*, Agricultural Handbook No. 84, U. S. Dept. of Agr., June 1955, p. 49.

MEASUREMENT OF BUTTER QUALITY BY CHEMICAL AND FLAVOR TESTS[1]

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THE problem of quality of a commodity is an intricate part of the economics of consumer demand. Theoretically, the market for a given commodity can be divided into several submarkets for the trading of the various qualities of this commodity. But the segregation into submarkets depends on the ability to set up distinct ranges of physical or chemical attributes for the various quality categories, and on the ability to maintain separate demands for these qualities (particularly to uphold the demand for the top quality segment of the commodity).[3]

Conditions for maintaining submarkets would be fulfilled only if categories of product qualities could be set up so that each quality group is homogeneous and its physical and chemical characteristics could be measured and reproduced, if the relative demands for the various qualities remained the same, if these differences in qualities and demand were identical at all levels of trade, and if the relative costs of producing varying qualities remained the same.

In reality, these conditions are seldom fulfilled. One difficulty stems from the fact that quality may mean different things to different people; or that quality may not be one attribute but a bundle of attributes. The criteria by which "quality" is judged may vary throughout the marketing channels or among buyers and consumers. Some may prefer fine flavors, some high keeping quality, others uniformity of the commodity. Thus "quality" of a product is usually a combination of attributes and each attribute may have its own market demand.

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[1] Published with the approval of the Director as Paper No. 733, Journal Series, Nebraska Agricultural Experiment Station.

[2] The data used in this analysis were collected by the first-named author while he was a member of the S. D. Agr. Exp. Sta. staff. Some of the data were collected in connection with a regional dairy marketing research project. Appreciation is expressed to the S. D. Agr. Exp. Sta. for permitting the use of the data in this article. Valuable comments were made by Louis Hermann, AMS, USDA, and Henry Tucker, Kansas State College. Mr. A. F. Dombrowski's assistance in making the computations is hereby gratefully acknowledged.

[3] See G. L. Mehren, "Interrelated Factors in Marketing Farm Products: Demand, Consumer Behavior and Product Quality," *Market Demand and Product Quality*, a report of the Marketing Research Workshop, Michigan State College, July 18-21, 1951, pp. 19 ff.

Butter Quality: Its Determination by the Organoleptic and the Quantitative Method

The purpose of this paper is to examine the degree of relationship existing among various methods of quality determination. There are today two major methods by which the qualities or certain qualitative attributes of butter moving through actual trade channels are measured:

(1) One is the classification of butter according to federal grade standards. Federal grades are based primarily on flavors discoverable by taste and smell.[4] Differences in grades are evaluated organoleptically and are at present not subject to quantitative measurements. Nonetheless, the organoleptic method of grading is regarded by most dairymen as a reliable tool for differentiating qualities and federal graders are trained and supervised to be able to distinguish even minor flavor differences.[5] Federal grades are used extensively by wholesale buyers for pricing their purchases from creameries. They are also used, to a limited degree, at the retail level where some butter is sold to consumers with a federal grade label.

(2) On the other hand dairy plant managers, dairy technologists and several government agencies also use a second set of methods to determine quality of butter: physical or chemical tests that measure either the processing techniques used by buttermakers or the quality (i.e. the wholesomeness) of the raw material used in the final product. Among the most common quantitative tests are the butterfat, the sediment and the mold test, tests determining the pH, fat acidity (FA) and more recently the water insoluble acids (WIA) content of the butter. The FA and WIA tests both measure the amount of free fatty acids and are used extensively to show the extent of decomposition in the fat of the raw material used in butter manufacturing. The WIA test has gained much publicity within the dairy industry because the Federal Food and Drug Administration and state agencies use it, in addition to other evidence, to detect whether or not butter has been produced from decomposed cream, i.e. whether or not it is fit for human use. Decomposed cream is held to be indicative of age and poor marketing and storing practices prior to processing.[6]

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[4] The kind and intensity of the predominating flavor present in the butter fix the *initial* grade classification. The *final* grade depends on the processing ability of the buttermakers, inasmuch as body, salt and color defects can lower the initial grade classification. Federal grades are: AA (93); A (92); B (90); C (89). Previous to 1954 butter could also be graded CG, cooking grade).

[5] I.e., differences between flavors, such as "slightly" or "definitely storage," cannot yet be measured quantitatively, even though federal graders might agree on this distinction between two specific samples of butter having these flavors.

[6] In a general way, dairy technologists consider a fat acidity value of about 0.5 or less, or a WIA value of about 100 or less, as very desirable in butter. In contrast,

The two methods of grading pursue different goals. The organoleptic method is used by the trade for the declared purpose of satisfying consumer tastes and preferences. The other method is used to check upon uniformity and accuracy of processing or to determine compliance with the provisions of sanitary laws and regulations. *Nonetheless, the two methods and the two sets of properties are not entirely unrelated, at least theoretically.* If we focus our attention primarily on the quality of the raw material used in butter, we should expect from the way in which flavors of butter are ranked by the official standards to determine the federal grades, that the greater the amount of decomposition of the cream used, the more "undesirable" the flavor becomes (i.e. the more pronounced the flavor defects). Consequently the lower the federal grade becomes the higher are the values of the tests measuring the decomposition of cream. In other words, there should logically be a general tendency for butter of higher federal grades to show low values and for butter of low grades to show high values in decomposition analyses.[7] If this inverse relationship were found to be close, quantitative measurements could be used as an alternative or supplementary basis for grading.

Quantitative measurements are most desirable as a basis for differentiating qualities or those quality attributes that are significant in grouping food products if it could be shown that they would also reflect differences in consumer tastes and preferences. In recent years, more and more food products have been studied for the purpose of finding quantitative measurements as a basis for quality differences.[8] In addition, for butter, such measurements may become necessary if the relationship between measurable characteristics and storability (perishability) is closer than between subjective grading and storability, because a large proportion of butter is now subject to long periods of storage.

Over-all Quality of the Sample

An analysis of federal grades and flavors and certain chemical tests was made in a study on marketing and quality problems of butter pro-

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a fat acidity of 0.7 or more, or a WIA value of 400 or more, is held to be indicative of decomposed cream and the Food and Drug Administration consideres WIA values of 400 or more as excessive and evidence of cream held too long or under unsatisfactory conditions.

[7] There are some flavors considered as undesirable that are not necessarily related to the age or the amount of decomposition of cream, such as feed and farm flavors, and flavors resulting from poor processing techniques. However this does not invalidate the statement above, if the occurrence of these flavors is relatively infrequent.

[8] Agreement between chemical and organoleptic tests is still the exception today.

duced exclusively from farm-separated sour cream in South Dakota.[9]

In terms of federal grades in force at the time of the study, a little more than 80 percent of all the butter graded was of U.S. Grade B, the remainder Grade C or CG (less than 1 percent in Grade A).

By far the most frequent flavor in Grade B butter (nearly 80 percent) was "old cream flavor" which is characteristic for butter manufactured from farm-separated sour cream that otherwise has no predominant flavor defects. The remainder was graded as having (in order of importance) "acidity," "utensil," "neutralizer," "weedy," "musty" or "barny" flavors.

Among the Grade C butter, "stale" and "metallic" flavors were by far the most important (together about 70 percent). These two flavors are usually indicative of unfavorable holding and handling methods of cream. "Alkaline," "neutralizer," "sour," "cheesy," "yeasty," "fishy," "weedy," "musty," "barny" made up the remainder. Some of these flavors may also develop from undesirable marketing methods.

The predominance of a few flavors in either grade, as well as the relatively infrequent occurrence of flavors (such as "barny"), not necessarily associated directly or indirectly with the age of cream or the degree of decomposition, was noteworthy. In addition, only a very small proportion (0.1 percent) of the one million pounds graded was found to have defects of body or color serious enough to affect the final grade. No color defects were found. Consequently, the flavor rating constituted by far the most preponderant criterion for grading.

For 368 salt butter samples, taken from the previously graded butter, pH, FA and WIA analyses were made. As could be expected, the chemical test values vary very widely except for the pH values for which the coefficient of variation was only 5 percent (Table 1). Out of the 368 samples, 11 had a WIA value of 400 or more.

Simple correlation analyses between the various test values showed (1) that there was a general tendency for fat acidity to increase as water insoluble acids increased, (2) that pH values increased with a decrease in fat acidity, and (3) that there is a small negative correlation between pH and WIA.[10] The regression lines for these variables are plotted on

[9] In the survey made in the early 1950's more than one million pounds of butter (about 1,000 churnings) ready for shipment to wholesalers or sale to final consumers were graded at the plant level in all of the state's butter plants. Several samples of butter were taken from churnings in each plant for physical and chemical analyses. These churnings totaled ¼ million pounds of butter (368 churnings).

The data are believed to be representative of the state's production of butter and probably reflect conditions prevailing in many areas in which butter is made from farm-separated cream.

The analyses were made by the South Dakota State College Dairy Department, and the State Chemist. The grading was done by a federal grader.

[10] The observed correlation coefficients were respectively: .696; —.666; —.181; each of these values is significantly different from zero at the 1% level.

TABLE 1. TESTS OF pH, FAT ACIDITY AND WATER INSOLUBLE ACID, 368 SAMPLES OF COMMERCIAL SALT BUTTER, PLANT LEVEL

Test	Range	Average	Coefficient of variation
pH*	4.48–8.13	6.84	5
Fat acidity**	.18–2.29	.84	37
Water insoluble acids***	37–539	181	52

* pH of butter serum (active acidity)
** ml. 0.1 N KOH per 10 g. fat
*** mg. of water insoluble acids per 100 g. fat

Chart I. The relation between fat acidity and WIA is of interest to dairymen who may wish to replace the more tedious WIA by the simpler fat acidity test. Actually, a positive correlation between the two series is to be expected but the value of the correlation coefficient observed is definitely not high enough to justify a recommendation for the use of the fat acidity test to predict WIA values with accuracy.

Chemical Test Scores and Federal Grades

Table 2 and Chart II show the distribution of chemical tests by federal grade. Because of the small number of samples in U.S. grades A and CG, samples in these two grades have been combined with samples of grades B and C respectively.

Statistical analysis showed that there was some simple, negative correlation between FA or WIA on one side and federal grades on the other. On the average the lower (federal) grades showed higher FA and WIA

TABLE 2. FREQUENCY DISTRIBUTIONS OF CHEMICAL TESTS (pH, FAT ACIDITY, WATER INSOLUBLE ACIDS) OF 368 SALTED BUTTER SAMPLES BY FEDERAL GRADES

pH			FA			WIA		
Class	No. in grades		Class	No. in grades		Class	No. in grades	
	U.S. A, B	U.S. C, CG		U.S. A, B	U.S. C, CG		U.S. A, B	U.S. C, CG
Less than 6.00	11	11	Less than .40	9	6	Less than 100	74	12
6.00 to 6.20	9	3	.40 to .60	46	12	100 to 200	106	34
6.20 to 6.40	21	16	.60 to .80	95	19	200 to 300	58	39
6.40 to 6.60	35	12	.80 to 1.00	60	21	300 to 400	22	12
6.60 to 6.80	48	11	1.00 to 1.20	32	23	400 to 500	2	7
6.80 to 7.00	39	11	1.20 to 1.40	14	9	500 and over		2
7.00 to 7.20	46	11	1.40 and over	6	16			
7.20 to 7.40	18	12						
7.40 to 7.60	16	5						
7.60 and over	20	14						
Total	262	106		262	106		262	106

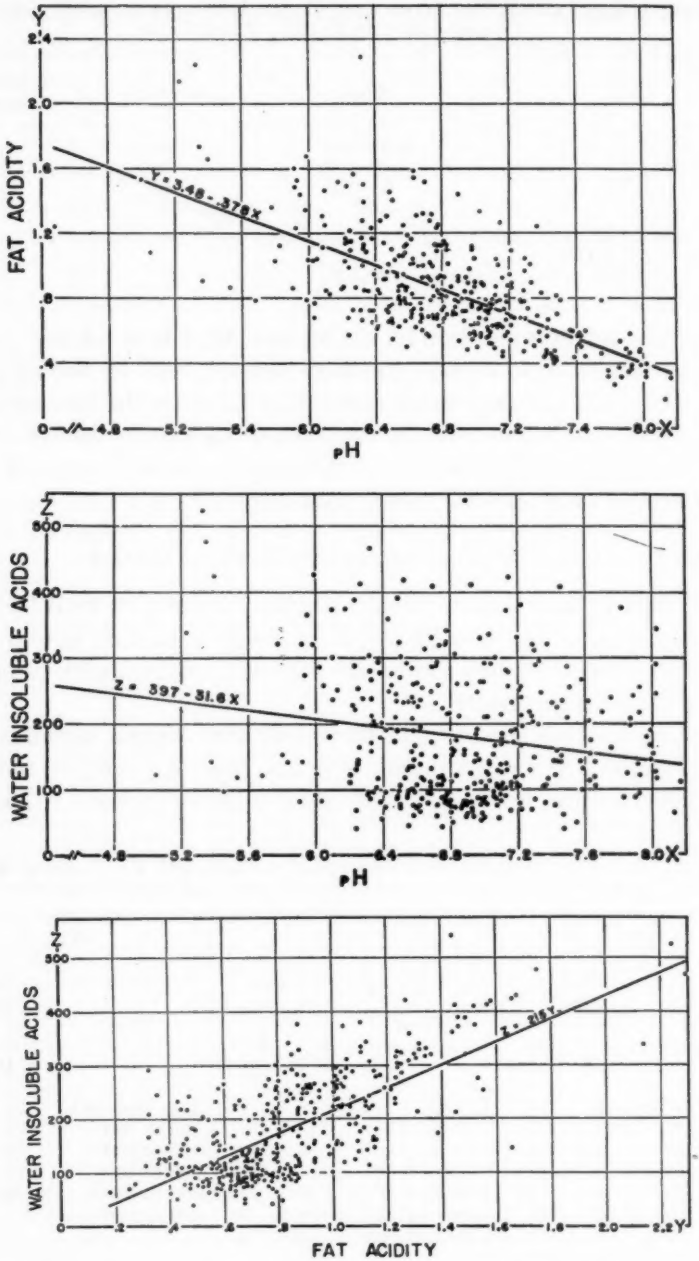

CHART I. SIMPLE REGRESSIONS BETWEEN pH, FA AND WIA, 368 BUTTER SAMPLES

Source: See footnote nine.

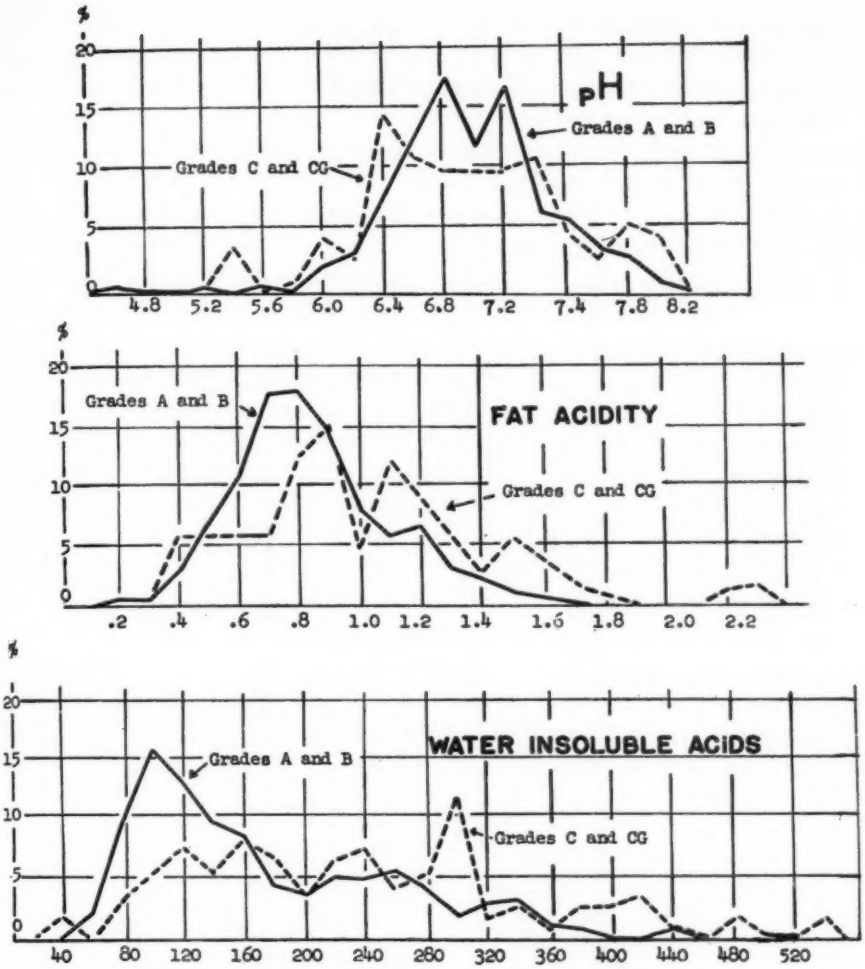

CHART II. FREQUENCY DISTRIBUTION OF CHEMICAL TESTS OF 368 BUTTER SAMPLES BY GRADES

Source: Table 2.

values than the higher grades. However, the dispersion of chemical values within each grade was very large and tended to increase with a decline in grade. For that reason, *individual* chemical values apparently do not (on the basis of this analysis) permit classifying butter into federal grades, and cannot be used with accuracy as an alternative or supplementary method (Table 3).

The problem of assessing the *joint* ability of chemical test scores to

TABLE 3. CHEMICAL ANALYSES OF 368 SALT BUTTER SAMPLES BY FEDERAL GRADES

Federal grade	No. of samples	pH				FA				WIA			
		Range	Average	Coeff. of var.	95% confidence limits for mean	Range	Average	Coeff. of var.	95% confidence limits for mean	Range	Average	Coeff. of var.	95% confidence limits for mean
A	6	6.61–7.18	6.89	3	6.66–7.12	.57–.80	.66	14	.56–.76	77–226	131	41	69–193
B	256	4.48–8.13	6.85	8	6.78–6.91	.18–1.66	.79	33	.76–.83	42–423	163	51	153–173
C	94	5.23–8.17	6.82	10	6.45–7.18	.31–2.24	.97*	40	.89–1.05	37–539	224*	48	202–247
CG	12	6.03–8.02	6.82	9	6.40–7.24	.32–2.29	1.02	46	.70–1.34	83–467	250	35	188–312

Significance of differences of averages between grades:
(a) For averages marked *, significant, at .02 level, from average in preceding higher grade.
(b) All other averages not significantly different at .05 level from average in preceding grade.

correctly predict federal grade is two-fold in that at best one can only observe experimentally the composite result of the physical relationship of chemical tests to federal grade and the inherent shortcomings of the prediction procedure used. In the event that the prediction is "good" (which would be suitably defined by the dairy technologist), then one can be sure that the procedure is "good" and that the physical relationship between the chemical tests and federal grade is real. However, if the prediction is "bad," then one cannot assert that chemical tests are "bad" predictors of federal grade since the prediction scheme may be at fault.

Because no optimum method of prediction exists in the literature and since the observed distributions of the individual test scores appear to be not necessarily normal, an adaptation of a nonparametric discrimination procedure of Evelyn Fix and J. L. Hodges was used.[11] To somewhat simplify the problem we require prediction in only one of two categories of federal grade, B or better (A-B) and C or worse (C-CG). Only FA and WIA test scores were used. The pH determinations were omitted to simplify the analysis on the thought that the pH distributions seemed to be quite similar in the two cases.

Random samples of size 5 of graded butter from each of the two categories above were drawn and their FA and WIA values were noted. In addition, a single butter sample was drawn at random from those butter samples previously classified in one of the two categories, and its FA and WIA values noted. Suppose that the results of this sampling were as follows:

Federal Grade			
A — B		C — CG	
FA	WIA	FA	WIA
.93	263	.76	215
.79	256	1.46	392
.65	78	.66	80
.36	121	1.12	222
.88	153	1.03	261

The single sample: Grade = A-B; FA = .63;WIA = 127

The classification procedure used involves the arbitrary selection of a small positive integer, k, and a definition of an ordering of the chemical observations (each of which is a pair of numbers representing the test

[11] E. Fix and J. L. Hodges, "Non-Parametric Discrimination-Consistency Properties," *School of Aviation Medicine*, Project 21-49-004, Project Report No. 4, Randolph Field, Texas; and "Non-Parametric Discrimination—Small Sample Performance," *School of Aviation Medicine*, Project 21-49-024, Project Report No. 11, Randolph Field, Texas.

values). The classification rule is then to classify the single butter sample in the federal grade category having the majority of the k nearest samples (as determined by the ordering).

To illustrate this procedure, let Y = FA, Z = WIA, where Y_o and Z_o stand for chemical values of the single sample (whose grade is to be predicted). Points (Y, Z) were ordered according to the magnitude of the expression

$$\Delta(Y, Z) = \left(1 - \frac{Y}{Y_o}\right)^2 + \left(1 - \frac{Z}{Z_o}\right)^2.$$

Small values of Δ denoting "nearness" to (Y_o, Z_o). This particular function was used because it remains invariant under changes in any scale factors.[12] Letting $k = 3$, we find the three nearest of the ten samples. They are underlined in the table. Since the majority of the three are from grade A-B, then our rule is to classify the single sample as A-B. (In this instance, the prediction is correct.)

To appraise this method of prediction, the same procedure was repeated thirty times independently when the single sample was really grade A-B and then thirty (30) times when the single sample was really grade C-CG, with the following results:

True Grade	Predicted Grade	
	A-B	C-G
A-B	20	10
C-CG	14	16

The interpretation of this sampling experiment is that if the federal grade is low (C-CG), then the predictive procedure is no better than random guessing. However if the federal grade is high (A-B), then the procedure based on chemical tests is somewhat better than random guessing. Examination of the distribution of FA and WIA values (Chart II) shows that the low grades (C-CG) have both a considerable amount of probability for high values and for low values, which puts the Fix-Hodges procedure at a disadvantage. High predictability of federal grades by these two chemical tests was not expected and the sampling experiment supported the expectation.

When the relation between pH, FA and WIA values was analyzed by federal grades, the correlation between the individual tests tended to increase with a decline from B to C, and there was an apparent decrease from C to CG (Table 4). However the latter may be a result of sampling variation produced by the small size of the CG sample.

[12] FA and WIA values are not measured on the same scale.

TABLE 4. CORRELATION BETWEEN CHEMICAL TESTS, BY FEDERAL GRADE

Grade	Number of samples	Correlation (r) between		
		pH-FA	pH-WIA	FA-WIA
B[1]	262	−.631	−.139**	.651
C	94	−.794	−.273*	.715
CG	12	−.608**	.009***	.645**

[1] Includes six samples of grade A butter.

Note: Significant at the .001 level except where marked * (.01 level) or ** (.05 level) or *** (not significant at the .05 level).

The differences in the "r's" are not significant at the .05 level except for the pH-FA relationship between grade B and C (significant at the .01 level).

Chemical Tests by Flavor Rating of Butter

One of the reasons why the relationship between grades and chemical tests is not closer may be the fact that a federal grade is not within itself a homogenous group. Table 5 shows a further breakdown of 271 samples

TABLE 5. CHEMICAL ANALYSES OF 271 SAMPLES OF BUTTER, BY FLAVOR CHARACTERISTICS

Grade and flavor	Number of samples	pH		FA		WIA	
		Aver.	Coeff. of var.	Aver.	Coeff. of var.	Aver.	Coeff. of var.
Grade A	3	6.83	2	.69	13	112	43
Grade B							
Slightly weedy and musty	4	6.36	3	1.07	27	219	46
Definitely old cream	160	6.84	7	.76	30	148	53
Definitely acid	4	6.91	2	.72	1	110	15
Definitely utensil	15	6.61	6	1.04	30	205	49
Definitely scorched	6	7.22	7	.61	26	166	47
Definitely neutralizer	15	7.04	8	.69	36	133	40
All B's	204	6.84	7	.78	33	153	52
Grade C							
Definitely fishy, yeasty, cheesy	4	7.03	4	.93	46	228	54
Definitely metallic	27	6.59	8	1.04	31	198	51
Definitely musty, barny	3	6.78	10	.91	49	151	64
Definitely stale	18	6.55	10	1.24	34	311	41
Other[1]	5	6.67	6	.70	34	211	32
All C's	57	6.67	9	1.06	38	234	52
Grade CG	7	6.67	6	1.07	53	256	43
All samples	271	6.80	8	.85	38	172	57

[1] Including combinations of flavors or samples with grade B flavor rating and excess defects of body or salt.

of butter for which the flavor was known, by the corresponding flavor comment. These flavors are listed in the sequence in which they are published in the Federal Register.

Some flavors are primarily the result of bacterial action, while others originate from farm handling practices or processing operations.[13] The chemical tests did not necessarily reflect these differences in types of flavors. For example, butter samples with a "definitely neutralizer" flavor did not have a pH significantly higher than the average butter sample. Slightly weedy or musty samples had higher FA and WIA values than any other grade B group while "definitely musty" and "barny" had low FA and WIA values in the grade C butter group. Some grade C flavors had lower average values of FA and WIA than some grade B flavors. In all groups, the variation in FA and WIA value was very high (partly, but not necessarily, because of the small number of samples in some groups).

That neutralizer flavor is related to the pH value of the butter can be questioned. Only a small proportion of samples with a pH exceeding 7.00 were designated "definitely neutralizer." There are clearly other causes of neutralizer flavor than merely adding enough neutralizer to raise the pH excessively. Such other factors may be the kind of neutralizer used or the method of addition.

In summary, therefore, chemical tests used to reflect characteristics of age and decomposition do not, according to this analysis, appear to be related to the flavors.

TABLE 6. DISTRIBUTION OF FLAVORS, INCLUDING NEUTRALIZER FLAVOR, BY pH OF THE BUTTER SERUM, 204 GRADE B SAMPLES

pH Range	Flavors				
	Neutralizer	Old cream	Utensil	All others	Total
Less than 6.19	1	8	1	1	11
6.20–6.59	3	42	4	4	53
6.60–6.99	3	52	7	3	65
7.00–7.39	2	40	1	3	46
7.40 and over	5	20	1	3	29
Total	14	162	14	14	204

Conclusions

The analysis of the extent to which age or decomposition of cream is reflected, both in (declining) federal grades and in (increasing) values of chemical tests designed to measure cream decomposition, is limited primarily here to the two lower grades B and C. Thus the results apply

[13] Some processing operations, however, are necessary because of bacterial action (such as the adding of neutralizer).

to butter made from farm-separated sour cream produced, marketed and processed under conditions similar to those in South Dakota. (A substantial proportion of the nation's butter is produced under similar conditions.)

From the above analysis it would seem that age or decomposition of cream used in butter is not always a major component of quality in determining a federal grade. Hence, this may point to a serious defect in the grading system. But this conclusion assumes that the chemical tests used in this study accurately reflect the age and decomposition of the raw material they are designed to measure. Some of the evidence presented above points to the fact that the chemical tests now used to detect the condition of the raw material do not agree among themselves very closely as to the degree of age or decomposition as indicated for a given sample. Consequently, the quantitative measurements now being used by dairy technologists or law enforcement agencies will have to be interpreted with considerable care and more perfect measures may have to be devised.

Even if one accepts flavors (and consequently federal grades) as a desirable indicator of quality, quality differences in as perishable a product as butter should be more subject to quantitative measurements than appears to be true at present.

PRICE EXPECTATIONS, PLANS, AND DECISION MAKING AMONG OHIO COMMERCIAL CATTLE FEEDERS

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Introduction

THE purpose of this study was to determine the nature of price expectations of Ohio commercial cattle feeders and how such expectations affect their plans with regard to buying feeder stock and selling fat cattle. Much effort has been directed toward the development of a theoretical explanation of such relationships within the firm. For this reason, empirical studies are necessary to determine the applicability of the theory.

In the field of agricultural economics, studies of both a theoretical and empirical nature have been directed to the problems faced by the entrepreneur planning for the future in an uncertain world. Early recognition of this problem is indicated by the attention given the cobweb theorem and more specific studies were concerned with problems of the firm in agriculture.[1]

From the point of view of the whole economy rather than just the agricultural sector, recognition of the pivotal role of expectations in income analysis is indicated by surveys of the Department of Commerce and the Securities and Exchange Commission concerning entrepreneurs' expectations on plant and equipment expansion and studies of the Survey Research Center of the University of Michigan for the Board of Governors of the Federal Reserve System concerning consumer plans and attitudes.

Nature of the Study

The present study had two rather specific objectives. The first was to determine how individuals in one particular group (Ohio commercial

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[1] Mordecai Ezekiel, "The Cobweb Theorem," *Quarterly Journal of Economics*, Vol. 52, February 1938, pp. 255-280; T. W. Schultz, "Spot and Future Prices as Production Guides," *American Economic Review*, Vol. 39, May 1949, pp. 135-149; T. W. Schultz, and O. H. Brownlee, "Two Trials to Determine Expectation Models Applicable to Agriculture," *Quarterly Journal of Economics*, Vol. 56, May 1942, pp. 487-496. These few references and this brief discussion are intended as a sample of what has been done in this area, not as a survey.

cattle feeders) form expectations concerning the prices of feeder stock and fat cattle and what the nature of such expectations is.[2] Are the expectations specific or hazy? To what extent does the individual have confidence in his expectations? The second objective was to determine how plans are related to these expectations, to what extent such plans are carried out, and the reasons for any changes that are made.

Essentially, this study is an attempt to apply some of the hypotheses formulated by others that, at least in part, appear to be helpful in analyzing economic behavior. Most writers agree that expectations affect plans and that plans are related to actions but there is some disagreement as to how expectations are formed. Shackle approaches this problem from the point of view of the amount of surprise associated with any particular outcome as well as the degree of pleasantness or unpleasantness of the possible outcome.[3] This is a two-dimensional approach specifically denying that the individual employs statistical probability in arriving at the amount of surprise to be associated with any prospective outcome. Hart, on the other hand, thinks that the individual assigns specific probabilities to each possible outcome in order to facilitate comparison.[4]

Neither of these approaches answers the fundamental question of how the entrepreneur arrives at his estimate of the likelihood of a particular outcome, but both recognize that plans and attitudes may change as more information is forthcoming. Keynes suggested that when the outlook is uncertain the entrepreneur may consider present conditions a fairly good indication of what the future will be.[5] Heady considers this as one of several possibilities among farmers estimating future prices or yields.[6] He also lists average prices, "normal" prices, future prices and those predicted

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[2] Although net profit is a fundamental consideration in making plans, certain prices are important stimulators while others are of less importance. Observations suggest that wheat farmers, for example, are more immediately affected by a fall in the price of wheat than they are by a rise in the cost of labor, seed, or machinery and react accordingly. Such reactions, although not entirely in accordance with prevalent theoretical assumptions about entrepreneurial behavior, appear to accord with reality. This study does not inquire into farmers reactions to changes in net profit expectations but rather is directed toward expectations regarding the most important stimulators, which are the selling price of the finished product (fat cattle) and the cost of the major input (feeder cattle). For this reason, specific inquiry was not made concerning expectations with regard to labor and feed costs, although clearly these factors also influence net profit expectations.

[3] G. L. S. Shackle, *Expectation in Economics,* Cambridge: The University Press, 1949.

[4] Albert G. Hart, *Anticipations, Uncertainty, and Dynamic Planning,* Chicago: The University of Chicago Press, 1940.

[5] J. M. Keynes, *The General Theory of Employment Interest and Money,* New York: Harcourt, Brace and Company, 1936.

[6] Earl O. Heady, *Economics of Agricultural Production and Resource Use,* New York: Prentice-Hall, Inc., 1952.

by outlook services or the county agent. Whatever method is used in explaining the process of expectation formulation, most writers agree that uncertainty leads to a tentative, short-run approach to planning with an emphasis upon caution and waiting for more information.

Farmers are confronted with various kinds of uncertainties, such as market, technological, technical and political.[7] Although technological and political uncertainty are important in the long run, perhaps short-run planning or the formulation of expectations on which to base plans in the short run is more directly affected by market and technical uncertainty. If this is true, a study of short-run planning may be helpful in testing the thesis that uncertainty affects resource utilization through its effect on expectation formulation. An ideal situation would be to study an industry affected only, or primarily, by one type of uncertainty and try to measure the effect of this uncertainty on expectations and plans.

Because commercial cattle feeding is an enterprise that appears to be characterized by a minimum of technical uncertainty, a study in this area should make possible an analysis of the relationship of market uncertainty to price-expectation formulation and planning as well as the farmer's reaction to changing market conditions. The basic assumption of the present study was that all factors other than price that affect feeding operations could be anticipated with perfect confidence by the farmer and therefore the problem of price expectation formulation could be studied in isolation. As indicated later, this assumption failed to take into consideration the fact that cattle feeders react to all the various elements in the total situation in which they find themselves even though price uncertainty loomed so large that other variables appeared certain by comparison.

With specific reference to Ohio commercial cattle feeders, this study tried to determine how precise price expectations are and what confidence the entrepreneur had in them and plans based on them. The accuracy of price expectations expressed was measured as well as the extent to which plans were carried out and reasons for any changes. A final problem concerned the extent to which farmers plan ahead to determine whether or not their decision making is basically short run.

Method

In order to acquire empirical data that might shed some light on these questions, two surveys were made among Ohio commercial cattle feeders

[7] Technological uncertainty results from the unpredictability of changes in the equipment and processes that farmers use while technical uncertainty is caused by the unpredictability of output in the production process resulting from the fact that the farmer does not have complete control over all inputs.

in seven counties where this industry is important. The first survey was made in April 1953 and was designed to determine what cattle feeders thought prices would be six months later and how such estimates affected their plans.[8] County extension agents distributed 450 questionnaires and 113 replies were received. These forms were not sent to all cattle feeders in each county but were sent to a list of feeders who make this enterprise a regular part of their farming operations. Those who feed on an in-and-out basis were not contacted. For this reason, the sample received is representative only of those who consider cattle feeding a relatively permanent part of their business.[9]

In December 1953, a second survey was made among the cattle feeders who had replied to the first survey. The second survey was designed to determine the extent to which plans were carried out and the reasons for any changes that were made. Although production of fat cattle can be altered by changing weight, grade or number, this survey measured the extent to which plans were carried out primarily in terms of adherence to the number planned. One hundred and six farmers received the second questionnaire and 75 replied.

Analysis of First Survey: Price Expectations and Plans

The major feature of the information contained in the replies to the first survey is the evidence of uncertainty with regard to market conditions that would exist at marketing time six months later. This is revealed by the range between each individual's estimate of the highest and lowest prices that could be expected for 1,000-pound to 1,100-pound choice beef steers in October.[10]

As Table I illustrates, a few cattle feeders made estimates within a range of one or two cents, but 86 percent of the respondents had a range of two cents or more and 65 percent had a range of three cents or more. The significance of ranges in excess of two cents per pound can be illustrated readily. Each cent per pound accounts for $10.00 in revenue from a 1,000-pound beef steer. For a farmer planning to market 100 steers,

[8] October was chosen as a future month during which most farmers would be particularly interested in cattle prices because a great deal of buying and selling takes place during the fall of the year.

[9] This may constitute a major defect in this study if one wishes to analyze the effect of reactions to uncertainty upon beef production because production adjustments made by the in-and-outers in response to price uncertainty may be far different from those made by other commercial cattle feeders. Future studies of this problem could be pointed in that direction.

[10] Heady and Kaldor used the range in expected prices as a measure of uncertainty in their study of southern Iowa farmers. See Earl O. Heady and Donald R. Kaldor, "Expectations and Errors in Forecasting Agricultural Prices," *Journal of Political Economy*, Vol. 62, February 1954, pp. 34-47.

TABLE I. MAXIMUM AND MINIMUM PRICES FOR CHOICE BEEF STEERS IN OCTOBER 1953 ESTIMATED BY 106 OHIO COMMERCIAL CATTLE FEEDERS, APRIL 1953

Range	Number of farmers	Number greater than upper limit	Percent greater than upper limit
(cents per pound)			
0.0–0.9	2	104	98
1.0–1.9	13	91	86
2.0–2.9	22	69	65
3.0–3.9	19	50	47
4.0–4.9	25	25	24
5.0–5.9	16	9	8
6.0–6.9	6	3	3
7.0–7.9	1	2	2
8.0–8.9	1	1	1
9.0–9.9	1	0	0
Total	106	—	—

each cent per pound means $1,000 in revenue. Thus, a farmer estimating prices within one cent is estimating his revenue within $1,000 if he sells 100 head. A range of two cents per pound is the equivalent of a range of $2,000 in total revenue. A farmer planning to market 100 steers and having a range of estimates of nine cents is indicating that he cannot guess within $9,000 of what his total revenue may be. Because cattle feeding is a business involving small margins between cost and selling price, most operators would expect to estimate the market within a very few cents per pound under ordinary conditions.[11] A range greater than two cents indicates considerable uncertainty concerning future market conditions.[12]

Another aspect of the estimates of beef cattle prices in future markets is illustrated by Table II which shows the distribution of the estimates of the most likely price in October. The arithmetic mean of these estimates of the "likely" price is 22.77 cents. The median is 23.00 cents. The current market price during April and May 1953 was approximately 23 cents for choice beef steers. Apparently many of these farmers were using the current price as a guide to future prices. Thirty-four percent ex-

[11] "Ordinary conditions" is a term that is easier to use than it is to define. The fact that these surveys were made toward the end of a period during which cattle prices had declined drastically probably caused many farmers to be cautious, pessimistic and uncertain. Such farmers would at least hope that the period from July 1952 to June 1953 would not be classified as "ordinary conditions." During this period, cattle prices declined by $10 per hundredweight and this decline was preceded by a fall from the peaks reached in 1951.

[12] This statement is based on an opinion expressed by James H. Warner, Department of Animal Science, The Ohio State University, in a private conversation May 13, 1953. Professor Warner is Secretary of the Ohio Commercial Cattle Feeder's Association.

TABLE II. PRICES OF CHOICE BEEF STEERS IN OCTOBER 1953 ESTIMATED BY 110 OHIO FARMERS, APRIL 1953

Estimate	Number of farmers	Number less than upper limit	Percent less than upper limit
(cents per pound)			
16.0–17.9	1	1	1
18.0–19.9	9	10	9
20.0–21.9	21	31	28
22.0–23.9	34	65	59
24.0–25.9	29	94	85
26.0–27.9	7	101	92
28.0–29.9	6	107	97
30.0–31.9	3	110	100
Total	110	—	—

pected prices to be within one cent of the current price while 31 percent expected lower prices and 35 percent expected higher prices.

Farmers were not alone in disagreeing about future cattle prices. Two "experts" in this field contacted at the time this survey was being made gave widely varying estimates of prices that would prevail in October 1953. One thought choice beef cattle would bring 23 cents while the other expected the price to be 28 cents.

A comparison of price expectations held by farmers and the "experts" with the prices that actually prevailed in October 1953 is interesting. Prices for choice beef steers in Chicago ranged from 22.75 cents to 28.00 cents during that month. According to this, both the "experts" and most of the farmers were right in their estimates. Perhaps a comparison of estimates with a price that would be more likely to be received by a seller during the period in question would be more realistic as a measure of the accuracy of estimates. The price used for this purpose is the median of prices quoted in Chicago (both high and low) during the month of October 1953.[13] This price was 25.375 cents per pound. Using this price as a basis for comparison, one "expert" was about nine percent low and the other was about nine percent high. Among 110 farmers making esti-

[13] Arriving at a price for choice beef steers that may be referred to as the actual price in October 1953 is somewhat difficult. Daily prices for a particular grade are quoted as a range from low to high. Sales that take place at each price within this range are not available. Without this distribution, assuming that the midpoint in the range is representative of that day's price is probably as realistic as any other assumption. During fifteen trading days in October 1953, this midpoint was a fraction less than 25 only once and exactly 25 only once. On the other 13 days, the midpoint ranged from 25.125 to 25.750. These daily midpoints cannot be weighted because information as to daily sales by grade is not available. The assumption made here is that equal weights may be attached to each day's midpoint of the range of prices for that day. The arithmetic mean of these prices is 25.383 and the median is 25.375.

mates of the "likely" fat cattle price, 21 percent were within two percent of the actual, 33 percent were within six percent of the actual, 52 percent were within 10 percent of the actual, 68 percent were within 15 percent of the actual, and 32 percent were in error by more than 15 percent. Thirty-nine (or 35 percent) of the farmers made more accurate estimates than the "experts." Although 14 percent of the farmers made estimates that were higher than the actual price, 68 percent made estimates that were at least five percent lower than the actual price. The great majority were pessimistic.

Fat cattle prices in the future are only part of the market estimate that a commercial feeder must make when he is planning future feeding operations. Given any particular level of feed and labor costs, the profit to be made feeding calves or yearlings depends on the prices at which they are bought and the price they bring later as fat cattle.

The price of feeder calves refers to calves weighing about 400 pounds. Because an animal this size is very efficient in converting feed into meat, a farmer can pay the same price per pound for a calf that he expects to sell as a beef steer and still make a profit, assuming that feed and labor costs are at a reasonable level. Although the feeder prefers to pay less, he may even pay a little higher price for calves than beef steers will sell for and yet make a profit on feeding.

On the other hand, yearlings weigh from 600 to 800 pounds and are much less efficient weight gainers. Some feed is required merely to hold their weight. For profitable feeding, they must be bought for less per pound than beef steers will sell for after feeding is completed. In other words, the difference in price between beef steers and yearlings must be positive. The larger this spread is, the more profit the feeder can make. If the spread becomes too small, or negative, a loss will be sustained.

In feeding calves, if the spread is positive the cattle feeder makes money on the feeding *and* on the price differential. If the spread is very small, or negative, he must make his profit on feeding alone. When the negative price spread exceeds the gain from feeding, a loss is sustained.

Because of these relationships, farmers planned to feed cattle next season must estimate the cost of feeder calves and/or yearlings in addition to the prospective selling price of fat cattle and feed prices. The important element is not each price, but the spread between them.[14]

[14] Strictly speaking, the comparison should be made between feeder prices in the fall and fat cattle prices at the time the feeders are sold as finished cattle—presumably some time the following year. This was not done because (1) fat cattle price expectations for such a time were not requested at the time feeder price expectations were ascertained—they probably did not exist—and (2) the thesis of this paper is that current price relationships are more important in planning than are price expectations formulated a year ahead. What counts is the day to day reaction to various conditions that determine the state of the market.

TABLE III. ESTIMATES OF LIKELY PRICES OF BEEF STEERS MINUS ESTIMATES OF LIKELY PRICES OF STEER CALVES IN OCTOBER 1953, BY 107 OHIO FARMERS, APRIL 1953

Beef steer price minus steer calf price	Number of farmers	Number less than upper limit	Percent less than upper limit
(cents per pound)			
−6.0 to −4.5	3	3	3
−4.0 to −2.5	15	18	17
−2.0 to −0.5	27	45	42
0.0 to 1.5	23	68	64
2.0 to 3.5	27	95	89
4.0 to 5.5	8	103	96
6.0 to 7.5	3	106	99
8.0 to 9.5	1	107	100
Total	107	—	—

Table III shows the distribution of spreads farmers expected in October 1953 between choice beef steers and choice steer calves. On this estimate, 42 percent of the farmers thought that the spread would be negative (i.e., calves would be higher than fat cattle), while 58 percent expected the spread to be positive. Thus, more than 40 percent expected this price relationship to be somewhat unfavorable.

Table IV illustrates the same data with regard to the expected spread between choice beef steers and choice yearling steers. In this case, 14 percent of the cattle feeders expected yearlings to be higher in price than fat cattle while 64 percent expected a positive spread of more than one and one-half cents. Both of these tables illustrate that about one-third of the respondents to the first survey were expecting an unfavorable price relationship between fat cattle and feeder stock.

What might be called the "actual" spread between fat cattle prices and

TABLE IV. ESTIMATES OF LIKELY PRICES OF BEEF STEERS MINUS ESTIMATES OF LIKELY PRICES OF YEARLING STEERS IN OCTOBER 1953, BY 107 OHIO FARMERS, APRIL 1953

Beef steer price minus yearling steer price	Number of farmers	Number less than upper limit	Percent less than upper limit
(cents per pound)			
−4.0 to −2.5	2	2	2
−2.0 to −0.5	10	12	11
0.0 to 1.5	27	39	36
2.0 to 3.5	31	79	65
4.0 to 5.5	24	94	88
6.0 to 7.5	9	103	96
8.0 to 9.5	1	104	97
10.0 to 11.5	3	107	100
Total	107	—	—

TABLE V. ERRORS IN BEEF-STEER/STEER-CALF SPREAD ESTIMATE FOR OCTOBER 1953, BY 105 OHIO FARMERS, APRIL 1953

Error	Number of farmers	Number greater than upper limit	Percent greater than upper limit
(cents per pound)			
0.0– 0.9	6	99	94
1.0 –1.9	5	94	90
2.0– 2.9	9	85	81
3.0– 3.9	18	67	64
4.0– 4.9	9	58	55
5.0– 5.9	14	44	42
6.0– 6.9	11	33	31
7.0– 7.9	15	18	17
8.0– 8.9	9	9	9
9.0– 9.9	6	3	3
10.0–10.9	1	2	2
11.0–11.9	2	0	0
Total	105	—	—

prices for feeder stock in October 1953 was favorable. These spreads may be calculated by deducting the feeder price during the middle of the month (estimates were for October 15th) from the actual price of fat cattle during the month.[15] The actual spread for feeder calves was 5.875 cents and for yearlings steers the spread was 6.375 cents. Tables V and VI contain distributions of the amount of error made in estimating the spreads that would exist in October. As Table V illustrates, more than one-half the farmers made an error of at least 5 cents in estimating

TABLE VI. ERRORS IN BEEF-STEER/YEARLING-STEER SPREAD ESTIMATE FOR OCTOBER 1953, BY 105 OHIO FARMERS, APRIL 1953

Error	Number of farmers	Number greater than upper limit	Percent greater than upper limit
(cents per pound)			
0.0– 0.9	13	92	88
1.0– 1.9	8	84	80
2.0– 2.9	13	71	68
3.0– 3.9	19	52	50
4.0– 4.9	14	38	36
5.0– 5.9	15	23	22
6.0– 6.9	13	10	10
7.0– 7.9	3	7	7
8.0– 8.9	5	2	2
9.0– 9.9	1	1	1
10.0–10.9	1	0	0
Total	105	—	—

[15] Feeder prices during the middle of October 1953 were very stable. The use of arithmetic means or medians gives the same result, namely, 19.00 cents for feeder steers and 19.50 cents for feeder calves.

the spread between fat cattle and feeder calves. Estimates of the spread between fat cattle and yearlings were a little more accurate, only one-third of the farmers made errors of 5 cents or more. In making their estimates about these price relationships, most farmers were quite pessimistic and the spreads existing in October 1953 were much more favorable than had been anticipated by the majority.[16]

The first survey also inquired about the plans that cattle feeders had for future feeding operations. Questions were asked concerning whether feeding operations would be larger of smaller in 1954 than in 1953 and whether more or fewer feeder cattle would be purchased. Plans expressed in April 1953 were classified according to whether cattle feeding operations would be the same, more, less, or the farmer remained undecided. Price and price relationship expectations expressed in other parts of the questionnaire seemingly have little relationship with plans as they are verbalized this far in advance of actual operations. This is indicated by an examination of averages of the various price estimates of those in each plan group. Average of estimates of fat cattle prices and feeder stock spreads in cents per pound were as follows:

Plan Group	*Number*	*Fat cattle price estimate*	*Calf spread estimate*	*Yearling spread estimate*
Same	40	23.22 cents	5.00 cents	2.69 cents
More*	16	22.21	—4.28	1.44
Less**	34	22.86	0.98	3.45
Undecided	18	22.00	—1.88	0.79

* Two farmers in this category could not make a "likely" price estimate but planned to expand anyway. One of these raises his own feeders and the other buys. No explanation was given for their plans.

** One farmer in this category could not make a "likely" price estimate but planned to reduce operations because of past price movements.

This table may be rearranged to show which groups had the most optimistic price expectations by listing the group for each type of price expectation in a descending order from the most favorable to the least

Fat cattle	*Calf spread*	*Yearling spread*
Same	Same	Less
Less	Less	Same
More	Undecided	More
Undecided	More	Undecided

favorable. When the most optimistic price expectations are expressed by those who plan the same operations or even a reduction in feeding, while those who plan to expand or are uncertain have the most pessi-

[16] Only four farmers made estimates that were higher than the actual for both feeder calf and feeder steer (yearling) spreads and one other farmer was high on the feeder calf spread only. The other one hundred farmers expected spreads to be either negative or smaller than they actually were.

mistic price expectations, other factors must be involved. This can be verified in part by an examination of the reasons expressed by those in each group for planning changes in operations in 1954 as compared with those in 1953.

Only one farmer in the group planning to expand feeding operations (more) mentioned price expectations in explaining his plans and his estimate of the future price of fat cattle was higher than the average for his group. Furthermore, his estimate of the spreads for feeder stock were quite optimistic. On the other hand, nearly a third of the farmers in this group mentioned feed prices or the availability of feed, and more than 80 percent mentioned factors specific to the individual farm, such as the existence of more barn space or a large cow herd, etc.

In the group planning a reduction of operations (less) 50 percent mentioned prospective prices. Those who mentioned prices had somewhat lower price expectations, on the average, than others in this group. The latter explained their plans to reduce operations primarily in terms of labor cost and availability, feed prices, and factors specific to the individual farm such as farming less acreage, facilities destroyed by fire, selling the farm, shifting to dairy farming or hogs, lack of barn space, and water supply polluted.

Among those who were undecided as to future feeding plans, price expectations were mentioned by more than 80 percent, and more than 20 percent mentioned feed prices. For these farmers, pessimism and uncertainty go together. It is possible that the pessimists had less confidence in their estimates and this caused them to be uncertain about their plans. Factors specific to the individual farm were not mentioned at all by those who were undecided.

Farmers planning the same level of feeding operations in 1954 as in 1953 did not give any explanation for such plans as the questionnaire was designed to bring out reasons for *changes* in plans from one year to the next. However, as the table indicates, the price and price relationship expectations of those in the "same" group were optimistic compared with those in other groups.

Analysis of Second Survey: Decisions and Reasons for Changing Plans

The next step in this study of price expectations and buying and selling plans involved a survey to determine the extent to which plans were carried out and the reasons for any changes that were made. As indicated earlier, this information was obtained by sending a questionnaire to 106 farmers who had participated in the first survey. The following analysis is based on replies received from 75 farmers.

Of the 75 farmers responding, 71 made replies concerning actual sales

of cattle. Twenty-six farmers, or more than 36 percent, made sales in 1953 exactly according to the plans they had indicated in the spring. Those who changed plans were almost evenly divided; i.e., 31 percent sold less than planned while 32 percent sold more than planned.

If adherence to plans is defined more broadly, however, the number of farmers who made either no change in plans or a relatively small change is found to be rather large. For example, 50 farmers or 70 percent had sales within 10 percent of those planned and widening the margin of error to 20 percent includes 56 farmers, or 79 percent of the total.[17]

Table VII illustrates the extent to which actual sales differed from

TABLE VII. ADHERENCE TO SELLING PLANS FOR 1953, AVERAGE PRICE EXPECTATIONS AND AVERAGE RANGE OF PRICE EXPECTATIONS, BY SALES GROUP, 71 OHIO FARMERS

Actual sales compared with planned sales	Average price expected for beef steers in October 1953	Average range of price expectations	Number of farmers
	(cents per pound)	(cents per pound)	
Same as planned	23.30	3.46	26
Up to 10% more	22.83	3.04	12
Up to 10% less	22.58	3.62	12
11 to 20% more	19.00	4.00	2
11 to 20% less	23.50	4.62	4
21 to 30% more	—	—	0
21 to 30% less	25.00	3.75	4
31 to 40% more	—*	—*	1
31 to 40% less	—	—	0
Over 40% more	20.31	3.25	8
Over 40% less	23.00	5.00	2

* Did not make an estimate.

planned sales. The average of fat cattle price expectations as well as the range of such expectations is shown for each category. Except for the category "21% to 30% less," those who sold less than planned had price expectations very similar to those who did not change their plans. On the other hand, those who sold more than planned had price expectations considerably less than the actual. Such farmers apparently responded to prices more favorable than they had expected. The similarity of ranges

[17] Most farmers probably do not consider a change of ten percent or less a real departure from plans. They do not plan specifically even if they appear to be able to verbalize specifically. A farmer confronted with space enough for one number on a questionnaire may state that he plans to sell 11 head of fat cattle whereas he may think in such terms as 10 or 12. Many of us retain mental flexibility by refraining from thinking of plans except in somewhat general terms. An average of one's generalized expectations is not the same thing as specific expectations. This may partially account for the difficulty of making a practical application of the concept of a "certainty equivalent" in an attempt to measure uncertainty.

in price expectations (except those in the "over 40% less" category) is an indication that farmers in the various categories had similar confidence in their expectations. Because of this, plus the fact that those who sold less than planned had price expectations similar to those whose plans did not change, it is difficult to generalize as to the group effect on plans when expected prices differ from actual prices. Although some farmers increase sales when prices are higher than expected, an examination of the responses made by individual farmers may be helpful in explaining why some farmers decreased sales while others increased them.

Some farmers who sold less than planned in 1953 did so for what may be called technical reasons. That is, a shortage of water or feed caused them to make fewer purchases in order to decrease their operations. On the other hand, some feeders refrained from selling as much as planned because they anticipated higher prices in the future. Those who marketed a lower grade than planned did so because of feed shortages or the belief that current prices did not justify the additional expense involved in raising the grade. Several farmers slaughtered for home use and this decreased their market sales. Of 17 farmers who explained their decrease in actual sales versus planned sales, nine cited the state of the market or expected prices while eight referred to technical factors. Five farmers who sold less than planned gave no explanation of the decrease in sales. In this group, the maximum decrease was six percent and the smallest decrease was one-half of one percent. These farmers apparently either do not consider such smal deviations a change in plans or they were unable to verbalize an explanation.

Twenty-three farmers sold more cattle in the fall than they had planned. Nine of this group gave no explanation of the change but only one of these nine made a change in excess of eight percent. One farmer who planned to market 130 head of cattle but actually sold 142 said: "The 130 was sort of an estimate. The number could easily vary." The other fourteen gave various explanations. Five concerned prices. Four gave technical factors such as selling some cows to reduce the cow herd or selling stock that had matured more rapidly than expected. Four mentioned feed. The latter factor worked in a twofold manner. In some cases a shortage of feed caused the sale of stock that the farmer had planned to feed longer. In other cases a larger corn crop than anticipated made feasible the feeding of a few more head than had been planned.

Remarks made by the farmers who increased their sales as a result of price considerations are interesting enough to be quoted in full. One farmer whose actual sales exceeded planned sales by 16 percent said, "About as planned kept cattle longer. Market was low in June, our normal selling season. So held till August or late July before selling."

This man did not consider a 16 percent increase in sales to be a deviation from plans. Another farmer whose sales increased 50 percent over those planned said, "We did not feed to as high a finish as usual due to decline in price. Put some in later to take up the slack." In this case, total sales for the year increased as a result of attempting to make up for reductions in feeding earlier in the season in response to lower prices. A somewhat similar situation may result when losses are sustained on some sales as this farmer explained when he said, "I put cattle back in, trying to cover losses on the last bunch." This pushed his sales 51 percent higher than planned. Another farmer whose sales increased 59 percent said, "I decided to run cattle on grass—price looked O.K." A 132 percent increase in sales by another cattle feeder resulted when "The price break in stock cattle about July 1st caused me to consider buying the big low grade cattle and give them 90 days pasture and 90 days in the feed lot. It was a good buy."

Although the fat cattle sales of nearly two-thirds of the farmers deviated to some extent from planned sales, many of them did not think that their plans had changed. This was especially true of those whose actual sales were within ten percent of planned sales. Among those whose sales were so different from plans that a change was recognized, price was an important factor for some but others were influenced by technical factors. These farmers seem to react to events as they occur and the significance of price or price *expectations* is difficult to establish. The role of price expectations in influencing action could not be called large for this group of farmers on the basis of the information received in this survey.

Analysis of Second Survey: Fall Purchases vs. Spring Estimates

Part of the second survey was designed to determine the feeder cattle purchases that were made in the fall so that these could be compared with estimates that had been made in the spring.[18] Table VIII summarizes the relationship between plans and actual purchases of 74 respondents. The fact that almost 33 percent adhered to their plans may be somewhat misleading in this instance. Only about eight percent purchased as planned while 24 percent planned to buy none and did not. This makes negative plans seem rather definite. The explanation is that in most of

[18] Less adherence to feeder purchase plans than to fat cattle sale plans might logically be expected, in view of the fact that no commitment to purchase had been made by cattle feeders at the time of the first survey. For many feeders, the "first move" toward fat cattle sales had been made (i.e., purchase of feeders in the spring) but the "first move" toward purchase of feeder stock in the fall had not been made. See Franco Modigliani, "The Measurement of Expectations," *Econometrica*, Vol. 20, July 1952, pp. 481-482.

TABLE VIII. PLANNED PURCHASES OF FEEDER CALVES AND YEARLING STEERS COMPARED WITH ACTUAL PURCHASES BY 74 OHIO FARMERS, 1953

Group intention	Number of farmers	Percent of total
Planned to buy and did not change plans	6	8.1
Planned to buy none and did not buy	18	24.3
Planned to buy none but did buy	4	5.4
Had no plans but did buy	13	17.6
Bought more than planned	21	28.4
Bought fewer than planned	12	16.2
Total	74	100.0

these cases the farmer raised his own feeders or bought in the spring. Of four farmers who planned no purchases but did buy, two cited the lower price as an explanation for the change but the other two gave no explanation. In one of the latter cases, however, the feeder price was much lower than had been estimated in the spring while in the other case the fat cattle price was much higher than had been estimated in the spring. Thus, in both cases the current ratio between fat cattle prices and feeder cattle prices was much more favorable than had been anticipated.

In the group that bought according to plans expressed in the spring, the average of expected fat cattle prices was less than the actual price in October. Furthermore, the average of prices paid for feeder calves and yearlings was about 5 cents and 7 cents, respectively, lower than had been expected. Much more favorable prices than had been expected had no effect on the buying plans of those in this group. Five of this group did not change plans for selling fat cattle and one decreased his sales by only one-half of one percent. Farmers in this group either fail to be guided by market prices or they are pessimistic when verbalizing price estimates, basing plans on "hoped for" prices that are higher than those expressed as estimates. If the latter is the case, a change in plans (expressed) need not necessarily follow if prices are higher than "expected."

Thirteen farmers had no buying plans but did buy. In this group, average feeder calf prices paid were 6½ cents less than the average expected. Average yearling prices paid were about 3½ cents less than expected. Fat cattle prices averaged nearly two cents higher than expected. Only four of these cattle feeders mentioned price as a factor in their purchases and half gave no explanation. Six of this group sold fewer fat cattle than planned, four sold the number planned, and the balance sold more than planned. Farmers in this group had a pessimistic price outlook and were apparently unable to *state* their buying plans six months in advance. This may not necessarily mean that they had no plans. The suggestion here is that they planned to buy *some* feeders but

their pessimism and uncertainty prevented them from formulating such plans specifically enough to verbalize them.

Twelve farmers purchased fewer feeders than planned. Price expectations in this group were pessimistic. The average expected fat cattle price was more than 3 cents lower than the actual, and average expected feeder prices were higher than the actual. Technical factors such as barn space shortage, a small corn crop, wells going dry, accounted for some decreases. In other cases, purchases were being deferred until later or the farmer was raising his own feeders. Only two farmers mentioned prices. One thought the risk too great (although he bought feeder calves for 2½ cents less than he expected and fat cattle were more than 3 cents higher than he expected) while the other expected lower feeder prices later.

Twenty-one farmers bought more feeders than planned. In this group, the average expected fat cattle price was 2 cents lower than the actual and prices paid for feeder cattle were from 3 to 5 cents lower than expected. Three of these cattle feeders had sold fewer fat cattle than planned but explained their feeder purchases in terms of the availability of feed and low feeder prices. One of them bought more feeder cattle because those he bought were lighter weight than he usually buys. The same explanation was given by two farmers who increased their purchases although their sales were the same as planned. Other explanations given by those whose fat cattle sales were as planned, but whose purchases were larger than planned, were stated in terms of cattle prices and the availability of feed; but prices were mentioned by only two out of a group of nine. Nine other farmers sold more fat cattle and bought more feeders than planned. Six of these mentioned cattle and feeder prices. Feed prices and the availability of barn space were mentioned by others in this group.

When actual prices are much more favorable than those anticipated, one would expect the entrepreneur to change his buying and selling plans accordingly. This analysis of feeder purchases does not lend great weight to such a hypothesis. Some farmers bought more feeders because of favorable prices, but others did not change their plans or even bought fewer than planned. Many farmers were influenced by technical factors. Some had no explanation for increasing purchases even though prices were better than they had expected. The reaction to a pleasant surprise was mildly positive by some but negative by others. Shackle indicates that the former will be the case but does not mention the latter.[19] Perhaps a mild positive reaction to a pleasant surprise results when the farmer is

[19] See G. L. S. Shackle, *Expectation in Economics*, Cambridge: The University Press, 1949. Shackle also indicates that there may be a delayed reaction to a pleasant surprise.

not really surprised at all; the favorable price is what he hoped for. On the other hand, a negative reaction to the pleasant surprise could result when the surprise is not pleasant enough; i.e., not what he had hoped for. As indicated above, other factors also enter into the picture.

Summary and Conclusions

As a group, the cattle feeders contacted in the surveys made in connection with this study are extremely cautious when they think about future prices and future plans. Many of them are guided by current prices in making estimates of future prices. This, of course, is a very common procedure for people who are looking into an uncertain future. The rather wide ranges in the estimates made by most farmers is some indication of the uncertainty with which such estimates are held.

Compared with actual prices in the fall, estimates made in the spring for fat cattle were in most instances low, while feeder price estimates were higher than the actual. In view of this fact, a somewhat general increase in feeding operations might logically be anticipated in response to the higher-than-expected prices. Such was not the case, however, and the failure of these entrepreneurs to fit into the theoretical pattern was accounted for by a variety of explanations. First, some feeders were still dubious about future prices and present purchases always involve a sale at some time in the future. Second, technical factors such as the availability of feed and other facilities caused some feeders to reduce rather than expand operations. Instead of a general expansion, some farmers reduced feeding, others proceeded as planned, and some expanded. Much of what occurred depended on factors other than prices.

Most of these farmers were uncertain about the future and pessimistic about future prices. The low estimates expressed, however, may not be the estimates on which they base their plans, when such plans do come into existence. Perhaps plans expressed for the relatively distant (six months) future are really not plans at all but are hazy estimates expressed in a conservative way. The planning process goes on continuously until action is actually taken, with the content of the plan becoming more and more specific as the time for action draws near. Six months prior to such action, however, in the cattle feeding industry it is quite possible that the connection between price expectations and plans lies in the fact that both are hazy and nonspecific.

Cattle feeders as well as other farmers are concerned with immediate, day-to-day problems that involve decision making. They do not make explicit estimates and detailed plans for the distant future.[20] This is prob-

[20] This coincides with the concept of the "first move" suggested by Modigliani when he said that "the decisionproblem of the firm at any point of time is that of choosing

ably particularly true of those who regard cattle feeding as a permanent enterprise and are not "in-and-outers." When these farmers are asked their opinions about future prices and plans, they will attempt to oblige by making rather precise estimates. Under such circumstances the characteristic procedure is to make conservative estimates. Such estimates, however, do not represent what the farmer hopes will be the case or what he will be satisfied with except perhaps as a rather bare minimum. For this reason, when prices turn out to be more favorable than he had estimated earlier, the "suprise" is pleasant but not sufficiently startling to evoke much change in his usual behavior. This is what he had "hoped for" but perhaps not "expected." On the other hand, his hopes may have been so strong and so much more optimistic than his "expectations" that the realization of his expectations could result in disappaintment—a somewhat unpleasant "surprise." The conclusion here is that the "expectation" that is stated by the farmer in response to a question some time before action is necessary is quite different from the "expectation" on which he will ultimately base his action.

The latter could be called his "action expectation." This may be so far below the surface of his consciousness at an early stage that he cannot express it; or it may be of a kind regarded as too optimistic (or pessimistic) to be brought out into public view. Because planning (arriving at a decision) is a slow process that is probably carried on at least partially subconsciously, the formulation of "action expectations" is also probably partly subconscious. Farmers do not set aside a certain portion of the day of week for planning but engage in such activities intermittently, either consciously or subconsciously. What they express in response to questions asked far in advance of actions may be a conservative preview of what may become "action expectations." The formulation of price expectations that will alter habitual behavior is probably extremely difficult under ordinary circumstances and is done only a short time before action is taken.

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an optimal first move rather than that of establishing a plan of action as suggested by much of the existing theory of the firm." See Franco Modigliani, "The Measurement of Expectations," *Econometrica*, Vol. 20, July 1952, pp. 481-482.

COSTS OF REARING AND EDUCATING FARM CHILDREN*

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THE purpose of this paper is to present costs of rearing and educating a farm child in the United States at prices prevailing in 1954.

Review of Literature

William F. Ogburn was one of the first investigators to figure the cost of rearing children. In a study of 200 Philadelphia families with incomes between $800 and $2,000 in 1918, he found that in rearing a child from birth to 16 years of age, $1,325 was added to the family budget.[1] However, Ogburn went on to state that the actual cost of what the child consumed was far greater than $1,325.

Three recent studies have been published on the cost of rearing children to age 18 in urban families having annual incomes of $2,500, $5,000, $6,500, and $10,000.[2] These studies found that the expenses of rearing children varied directly with the incomes of their parents. The cost of rearing a child to age 18 was $7,766 for urban families having annual incomes of $2,500 in 1935-36. However, the expenditures increased to $31,000 for families whose annual incomes averaged $10,000 during the year 1949 or 1950.

O. E. Baker made the first published study of the costs of rearing farm children. He estimated that it cost $2,250 during 1922-1930 to rear and educate the average child on farms in the United States to the age of 15.[3] By allowing $50 per year for the labor contribution from 10 to 15 years of age, the cost of rearing and educating children was reduced $250, to a net expense of $2,000.

The only other published study on the cost of rearing farm children

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[1] William F. Ogburn, *The Financial Cost of Rearing a Child*, United States Department of Labor, Children's Bureau Conference Series No. 1, Standards of Child Welfare, pp. 26-30, 1919.

[2] Louis I. Dublin, Alfred J. Lotka, and Mortimer Spiegelman, *The Money Value of a Man*, New York: The Ronald Press, 1946, Chapter 4, "Cost of Bringing Up a Child," pp. 44-58. Also, Louis I. Dublin, "What It Costs to Raise a Child to 18," *Woman's Home Companion*, May 1947, pp. 38 and 59; The Mutual Life Insurance Co. of New York, brochure entitled "What It Costs to Bring Up a Baby," no date; and "How Much to Raise a Child?" *Changing Times, the Kiplinger Magazine*, Dec., 1950, pp. 14-15.

[3] O. E. Baker, "Rural-Urban Migration and the National Welfare," *Annals of the Association of American Geographers*, Volume XXIII, No. 2, June, 1933, pp. 86-87 and *Two Trends of Great Agricultural Significance*, United States Department of Agriculture, Extension Service Circular No. 306, June, 1939, p. 6.

was made by Long and Dorner.[4] They estimated the cost of rearing Tennessee children to ages 5, 10, 15, and 21 in families having disposable net cash incomes of under $1,250, $1,250-$2,199, and $2,200 and over.[5] Their estimates show that an average investment of more than $3,100 was required to rear a child to age 15 in farm families having incomes less than $1,250 in 1949.

None of these published estimates were considered adequate for use in this study. First, the cost of rearing children is generally higher in urban than in farm families. Therefore, the cost estimates for urban children were not applicable. Second, neither the estimates prepared by Baker for 1922-1930, or by Long and Dorner for the year 1949, were considered applicable for the year 1954 because of changes in prices, family incomes, and values of consumption.

Costs of Rearing Children at 1954 Prices

The most recent consumer expenditure data available for a representative sample of farm families in the United States was for the year 1941. Expenditure data were obtained from 733 rural-farm families and 29 single consumers, or a total of 762 consumer units. The total value of family consumption averaged $1,344 per farm family during 1941 (Table 1).

Since the prices paid by farmers in the United States for consumer commodities in 1954 were 110.5 per cent higher than in 1941, the same level of family living as attained in 1941 would have then cost $2,829, or $1,485 more.[6] The $1,485 was apportioned to the various consumption items on the basis of family consumption in 1941. Table 1 shows the average value of farm family consumption in 1941 and the amount required to maintain the same level of family living in 1954, assuming similar distributions in the two years.

Data on the value of consumption of farm families in the United States were not available for the year 1954 and any attempt to estimate the

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[4] C. Horace Hamilton adjusted Louis I. Dublin's estimates for urban children and applied them to the 260,000 migrants from North Carolina between 1940 and 1950. He assumed that the migrants represented an economic contribution of at least $15,000 per capita. See his "Tarheels on the Move," *Research and Farming*, North Carolina State Agricultural Experiment Station Quarterly publication, Winter and Spring, 1953, pp. 10 and 15.

[5] Erven J. Long and Peter Dorner, "Excess Farm Population and the loss of Agricultural Capital," *Land Economics*, November 1954, pp. 363-368.

[6] In 1941, the index of prices paid by farmers in the United States for all commodities used in family living, 1935-39 = 100, was 105. In 1954, the index was 221. Therefore, it cost $2,829 in 1954 to maintain the same level of living as did $1,344 in 1941 ($\frac{221}{105}$ x $1,344 = $2,829). Price indexes were obtained from *The Farm Income Situation*, Agricultural Marketing Service, USDA, 1955 Outlook Issue, EIS-149, October 1954, p. 26, and special tabulation of 1954 indexes from the USDA.

TABLE 1. VALUE OF CONSUMPTION OF RURAL-FARM FAMILIES, UNITED STATES, 1941 AND 1954

Consumption Item	Average Value of Family Consumption	
	1941	1954
		Amount required to maintain the same level of family living as in 1941
Food	$ 589	$1,240
Housing, fuel, light, and refrigeration	232	488
Household operation	34	72
Furnishings and Equipment	72	151
Clothing	153	322
Automobile and other transportation	109	229
Personal care	20	42
Medical care	60	126
Recreation	26	55
Tobacco	17	36
Reading	7	15
Education	8	17
Other	17	36
Total money expense	823	—
Total received in kind	521	—
Total value of family consumption	1,344	2,829

Source: *Family Spending and Saving in Wartime*, U. S. Dept. of Labor Bul. No. 822, Bureau of Labor Statistics, 1945, p. 75.

amount would have been highly questionable since the proportion of net family income spent on consumer commodities varies from year to year. During the first few years of a business recession, the amount of money spent for consumption tends to decline less than family income because families attempt to maintain their living at the same level by the spending of savings or by borrowing. If the cycle of declining economic activity continues for a prolonged period, families eventually decrease their consumer spending when savings are depleted. In the early phase of a cycle of economic recovery or prosperity, the amount of savings tends to increase relatively more than does family consumer expenditures.

Although the index of prices paid by farmers in the United States for all commodities bought, including interest, taxes and wage rates, was higher in 1954 compared to 1941 than the prices received by farmers for all farm products, there is some indication that the total average value of consumption of U. S. farm families in 1954 may have been larger than the $2,829 required to maintain the same level of family living as in 1941.[7]

[7] The index of prices paid by farmers in the United States for all commodities bought was 209.5 per cent higher in 1954 than in 1941 (1935-39 = 100). The index of prices received by farmers was 202.6 per cent higher in 1954 than in 1941 (1935-39 = 100). Source: *Agricultural Statistics*, USDA, 1952, pp. 682 and 684-85; 1953, pp. 602 and 604; and *Oklahoma Current Farm Economics*, Vol. 27, No. 6, December 1954, p. 119.

The purchasing power of the net income per farm from all sources in the United States was about $50 larger in 1954 than in 1941 (1935-39 base = 100).[8] In terms of the purchasing power of 1935-39 dollars, farm operators had slightly more net income in 1954 than in 1941, and therefore may have spent more money on consumer expenditures in 1954 than $2,829. The estimate of the total value of farm family consumption in 1954 therefore appears to be a conservative figure.

This procedure assumes that the proportion of the total family consumption expenditures devoted to the various categories of expenditure in 1941 remained relatively stable and that farm family consumption habits remained relatively constant through 1954. In regard to this assumption, researchers know that farm family expenditures undergo changes from time to time as new items appear in retail markets and other items are no longer produced. Yet, a recent study shows that the proportions of the total consumption expenditures of farm families devoted to the various categories of expenditures tend to remain relatively stable. This study compared Illinois farm family expenditure patterns of 1946 with the Illinois-Iowa analysis unit of the Consumer Purchases Study for 1935-36. The report states: "Considering the great changes over the decade in income, prices, and supplies of consumer goods, the overall similarity of the two patterns is noteworthy. Moreover, the major changes, those in transportation and in furnishings and equipment, resulted in large part from temporary dislocations of the normal supply and demand situation."[9] It is probable that spending for furnishings and equipment and for automobiles since 1946 has tended to become more like the prewar pattern as wartime scarcities have disappeared and the backlog of demand has been met.

The example cited shows very little change in expenditure patterns of farm families between 1935-36 and 1946. There may have been greater changes in the patterns of spending between 1941 and 1954, but the changes should not differ greatly from those noted between 1935-36 and 1946.

The costs of rearing a farm child in the United States in 1954 were figured for a family of four, husband, wife, a son age 13, and a daughter

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[8] The purchasing power of the net income per farm in the United States (1935-39 = 100) in 1941 amounted to $1,573. In 1954 (1935-39 = 100) the purchasing power of the net income per farm was $1,624. Figures were based upon data given in *The Farm Income Situation*, Agricultural Marketing Service, USDA, 1955 Outlook Issue, EIS-149, October 1954, pp. 19 and 25; *The Farm Income Situation*, FIS, 1951, USDA; and *Agricultural Statistics*, USDA, 1952, pp. 684-85 and 1953, p. 604.

[9] Jean L. Pennock, *et al.*, *Farm Family Spending and Saving in Illinois*, USDA, Agr. Info. Bul. No. 101, 1954, p. 4.

age 7, with a total value of family consumption of $2,829.[10] The expenditures are as follows:

Cost of birth. The first expense that must be considered is the cost of bringing a child into the world. The total cost of childbirth varies among families according to whether the mother chooses a specialist or a general practitioner to attend her, and whether her confinement is at home or in a hospital.

In 1954, it was estimated that the physician's fee for prenatal care and delivery was $75, the hospital bills for the mother $100, the layette and incidentals for the baby $40, and a housekeeper for two weeks $60. The total cost of a hospital birth averaged about $275, compared to $175 for births occurring at home. Since only about 20 per cent of the births to farm mothers occurred at home in 1954, the average cost for all births of farm children was about $255.

Cost of food. Food was the largest single item in the farm family budget in 1954, a total of $1,240 (Table 1). This figure included the value of food produced on the farm for home use.

In order to determine what proportion of the $1,240 was expended on each child, it was necessary to obtain the relative value of food consumption of each individual, by age and sex. The adult male expenditure units of food appearing in Table 2, were used to obtain these figures. The farm family of four consumed 3.72 adult male units of food, amounting to $333.33 per adult male unit per year.

It cost $170 to feed an infant during his first year of life. The food bill increased to more than $240 for a male child age 6, and to more than $300 at age 9. The maximum cost of food occurred for children between the ages of 16 and 19. During this late adolescent period boys consumed $380 worth of food per year and the food cost for girls was $336 (Table 2).

Cost of clothing. The annual expenses for the clothing of children was estimated in a similar way as food costs. The family clothing expenditures totaled 3.30 adult male units. Since the family spent $322 for clothing in 1954, each adult male unit cost $97.58.

During the first two years of life, the cost of children's clothing, excluding the initial cost of layette, was less than $25 per year. However, at age 16 and over, clothing costs amounted to about $125, with expenditures for girls larger than for boys.

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[10] There was an average of 4.13 persons per rural-farm family and an average of 3.98 persons per rural-farm household in the United States in 1950. Ages of the children were interpolated from survey schedules of farm families who had two children at home. The 1941 sample of U. S. farm families had an average of 4.03 persons per family and also had a greater proportion of adults than the hypothetical family of four persons described here. Costs were figured for a family of four in 1954 because the size of families and number of adult children at home had probably declined since 1941.

Cost of medical care. Farm families in the United States spent an average of $126 for medical and dental care in 1954. The expenses for children were figured by the same method used in obtaining costs of food and clothing.

Farm families spent $22 on medical care for infant sons, and only $14 for infant daughters. The cost of medical care increased to about $20 at age 10. Expenses for girls age 20-24 was twice as high as for boys; at age 25-29, the costs were almost three times as high as for boys.

Cost of education. The expenses for education, except for books, paper, and other necessary school articles, do not enter directly into the farm family budget. The amount that parents contribute toward the education of their children attending public school cannot be determined precisely because most school districts receive state and some federal aid. Parents, however, share the tax burdens, either directly or indirectly, or both, for support of public schools. Although the costs of maintaining school systems are not borne exclusively by families with children, the expenses of educating youths are included here.

The estimated annual expenditure (excluding interest) per pupil in average daily attendance in full-time public elementary and secondary day schools in the United States during 1954-55 was $262.[11] In 1950, the rural-farm males in the United States 20 years of age had completed 9.5 years of education. Rural-farm females had completed 10.7 years. The cost of education was estimated by assuming that girls in 1954 had completed 11 grades in school and boys 10 grades. Therefore, the total cost of education was $2,882 for girls and $2,620 for boys.

Miscellaneous expenditures. Unlike food, clothing, medical care, and education, the remaining items in the family budget such as household operations and furnishings, rent, automobile, etc., were family expenses and therefore were apportioned equally among the four members of the family.[12] The cost of these living items for the average farm family in 1954 was $1,141. Thus, each child's share was $285.25 per year.

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[11] Source: Estimates prepared by National Education Association and furnished by Dr. E. M. Foster, Office of Education, Department of Health, Education, and Welfare, Washington, D.C.

[12] Various concepts and methods have been used in estimating the costs of rearing children. Some computations are based on family living expenditures. Others have not been based on actual costs but on the relative differences in income required by families of differing sizes to maintain the same level of living or of well being.

In some studies family overhead expenses, such as rent, household furnishings and household operations, were included as a cost of rearing the child. In other studies, these overhead costs were excluded.

Two concepts of cost have been employed when considering the living costs of a child of a particular age and sex. The "average cost" concept assumes that the cost of living of the second, third, or fourth child is the same as that for the first child. The "marginal cost" concept assumes that the successive addition of one, two, or three children to the family is a marginal cost, or overhead cost to the husband and

TABLE 2. COST OF REARING FARM CHILDREN IN THE UNITED STATES, BY AGE AND SEX, 1954

MALE

(1)	(2)		(3)		(4)		(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)
Age	Food		Clothing		Medical Care		Education	Expenditure for other items	Total cost of living per annum	Accumulative total	Value of labor[4]	Accumulative total	Net annual deficit or balance of total cost minus labor (Col. 7–9)	Accumulative net balance
	Adult[1] unit	Expenditure	Adult[2] unit	Expenditure	Adult[3] unit	Expenditure								
	unit	dollars	unit	dollars	unit	dollars	dollars	dollars	dollars	dollars	dollars	dollars	dollars	dollars
Birth								255	255	255			−255	255
under 1	.51	170	.24	24	.71	22		285	501	756			−501	756
1	.54	180	.24	24	.52	16		285	505	1,261			−505	1,261
2	.55	183	.36	35	.52	16		285	519	1,780			−519	1,780
3	.59	196	.36	35	.52	16		285	532	2,312			−532	2,312
4	.61	203	.36	35	.52	16		285	539	2,851			−539	2,851
5	.65	216	.36	35	.52	16		285	552	3,403			−552	3,403
6	.73	243	.55	54	.52	16	262	285	860	4,263			−860	4,263
7	.80	266	.55	54	.52	16	262	285	883	5,146			−883	5,146
8	.87	290	.55	54	.52	16	262	285	907	6,053			−907	6,053
9	.91	303	.55	54	.52	16	262	285	920	6,973			−920	6,973
10	.95	316	.55	54	.69	21	262	285	938	7,911	159	159	−779	7,752
11	.98	326	.55	54	.69	21	262	285	948	8,859	159	318	−789	8,541
12	1.03	343	.77	75	.69	21		285	724	9,583	159	477	−565	9,106
13	1.07	356	.77	75	.69	21	262	285	999	10,582	159	636	−840	9,946
14	1.12	373	.77	75	.69	21	262	285	1,016	11,598	325	961	−691	10,637
15	1.12	373	.77	75	.54	17	262	285	1,012	12,610	325	1,286	−687	11,324
16	1.14	380	1.23	121	.54	17	262	285	1,065	13,675	666	1,952	−399	11,723
17	1.14	380	1.23	121	.54	17		285	803	14,478	666	2,618	−137	11,860
18	1.14	380	1.23	121	.54	17		285	803	15,281	1,166	3,784	+363	11,497
19	1.14	380	1.23	121	.54	17		285	803	16,084	1,166	4,950	+363	11,134
20	1.12	373	1.23	121	.82	25		285	804	16,888	1,403	6,353	+599	10,535
21	1.12	373	1.23	121	.82	25		285	804	17,692	1,466	7,819	+662	9,873
22	1.12	373	1.23	121	.82	25		285	804	18,496	1,466	9,285	+662	9,211
23	1.12	373	1.23	121	.82	25		285	804	19,300	1,466	10,751	+662	8,549
24	1.12	373	1.23	121	.82	25		285	804	20,104	1,466	12,217	+662	7,887
25	1.12	373	1.23	121	.78	24		285	803	20,907	1,516	13,733	+713	7,174
26	1.12	373	1.23	121	.78	24		285	803	21,710	1,516	15,249	+713	6,461
27	1.12	373	1.23	121	.78	24		285	803	22,513	1,516	16,765	+713	5,748
28	1.12	373	1.23	121	.78	24		285	803	23,316	1,516	18,281	+713	5,035
29	1.12	373	1.23	121	.78	24		285	803	24,119	1,516	19,797	+713	4,322

TABLE 2 (CONTINUED)

FEMALE

Birth														
under 1	.51	170	.24	24	.45	14		255	255	255			−255	255
1	.54	180	.24	24	.53	16		285	493	748			−493	748
2	.55	183	.34	33	.53	16		285	517	1,770			−505	1,253
3	.58	193	.34	33	.53	16		285	527	2,297			−517	2,297
4	.60	200	.34	33	.53	16		285	534	2,831			−527	2,831
5	.63	210	.34	33	.54	16		285	544	3,375			−534	3,375
6	.67	223	.52	51	.54	16	262	285	837	4,212			−837	4,212
7	.73	243	.52	51	.54	16	262	285	857	5,069			−857	5,069
8	.79	263	.52	51	.54	16	262	285	877	5,946			−877	5,946
9	.84	280	.52	51	.54	16	262	285	894	6,840			−894	6,840
10	.88	293	.52	51	.65	20	262	285	911	7,751	30	30	−881	7,721
11	.90	300	.52	51	.65	20	262	285	918	8,669	30	60	−888	8,609
12	.93	310	.84	82	.65	20	262	285	959	9,628	30	90	−929	9,538
13	.97	323	.84	82	.65	20	262	285	972	10,600	30	120	−942	10,480
14	1.01	336	.84	82	.65	20		285	723	11,323	59	179	−664	11,144
15	1.01	336	.84	82	.95	29	262	285	994	12,317	59	238	−935	12,079
16	1.01	336	1.32	129	.95	29	262	285	1,041	13,358	118	356	−923	13,002
17	1.01	336	1.32	129	.95	29	262	285	1,041	14,399	118	474	−923	13,925
18	1.01	336	1.32	129	.95	29		285	779	15,178	346	820	−433	14,358
19	1.01	336	1.32	129	.95	29		285	779	15,957	346	1,166	−433	14,791
20	1.00	333	1.32	129	1.58	49		285	796	16,753	392	1,558	−404	15,195
21	1.00	333	1.32	129	1.58	49		285	796	17,549	312	1,870	−484	15,679
22	1.00	333	1.32	129	1.58	49		285	796	18,345	312	2,182	−484	16,163
23	1.00	333	1.32	129	1.58	49		285	796	19,141	312	2,494	−484	16,647
24	1.00	333	1.32	129	1.58	49		285	796	19,937	312	2,806	−484	17,131
25	1.00	333	1.32	129	2.30	71		285	818	20,755	232	3,038	−586	17,717
26	1.00	333	1.32	129	2.30	71		285	818	21,573	232	3,270	−586	18,303
27	1.00	333	1.32	129	2.30	71		285	818	22,391	232	3,502	−586	18,889
28	1.00	333	1.32	129	2.30	71		285	818	23,209	232	3,734	−586	19,475
29	1.00	333	1.32	129	2.30	71		285	818	24,027	232	3,966	−586	20,061

[1] Hazel K. Stiebeling, Day Monroe, et al., *Family Food Consumption and Dietary Levels*, Consumer Purchases Study, U.S. Dept. of Agr., Miscellaneous Pub. No. 405, 1941, p. 372.

[2] The adult male units of clothing expenditures were based upon data of the expenditures of 66,165 individuals in 20 states, 1935–36, obtained in the Consumer Purchases Study, Expenditure of husbands was taken as 1.00. Source: *Family Income and Expenditures*, Part 2, Farm Series, Consumer Purchases Study, Misc. Pub. No. 465, U.S. Dept. of Agr., 1941. pp. 182–193.

[3] The adult male units of medical care expenditures are based upon data compiled by the Committee on the Costs of Medical Care in towns of less than 5,000 and in rural areas, in a 12-month period, 1928–1931. Expenditure for males 20 years and over was taken as 1.00. Source: Helen Hollingsworth, Margaret C. Klem, and Anna Mae Brady, *Medical Care and Costs in Relation to Family Income:* A Statistical Source Book, Bureau Memorandum No. 51, Federal Security Agency, Social Security Administration, Bureau of Research and Statistics, Washington, D.C., 1947, Table 149, p. 178.

The application of the adult-male expenditure units for individual consumption items (food costs in 1939; clothing costs in 1935–36; and medical care expenses in 1928–31) to 1954 assumes that the cost relationships among family members of different age and sex remained the same as in 1941.

[4] The number of hours that youth 14–29 years worked during 1954 was assumed to be the same as that worked during the year 1950. The number of hours that farm youth 14–29 years of age worked during the census week of 1950 was taken from the *1950 U.S. Census of Population*, U.S. Summary, P-C1, p. 259. (The number of hours that 10 to 13 year old youth worked is an estimate.)

The hourly wage for 1954 was obtained by averaging the index numbers of farm wage rates for the U.S., 1935–39 = 100, and adjusting the 1950 hourly farm wage rate (69 cents) without room and board. The index numbers of farm wage rates were secured from USDA, Agr. Marketing Service, *Farm Labor*, February 10, 1955, p. 5.

Labor contribution of children. The monetary value of the labor of children was subtracted from their expenses of rearing and educating to obtain the net expenditures borne by the parents. However, no estimate of the value of household work was made. As a result, the labor income of farm girls was much lower than that for boys because fewer of them were members of the labor force and they worked less outside the home than did boys. Therefore, the estimated monetary value of girls' labor is not strictly comparable to that for boys.

Data were not available for the year 1954 on the number of hours that farm youths were employed. Estimates of the value of their labor income in 1954 were based on 1950 census data by assuming that the labor output of farm youths was the same in 1954 as in 1950 (Table 2).

The average annual value of a boy's labor, age 14 and 15, in 1954 was $325. Table 2 reveals that family expenditures on a boy exceed his labor contribution until he reached age 18. During the 18th year, a son cost the family $803 to maintain, but he earned $1,166 by his labor. This was $363 more than the cost of his maintenance during the year. At the boy's nineteenth birthday, the family had spent $15,281 in rearing and educating him. His accumulated labor income amounted to $3,784, which left a net expenditure of $11,497 to the parents.[13]

The labor incomes of farm girls were unusually low because few were members of the labor force, and also the value of their household labor was excluded. Therefore, the value of their labor was more than the figures indicate. Although their household labor did not contribute directly to income, it did serve to cut family expenses. The highest labor income for girls was reached at age 20 when they earned $392 per year at work outside the home. The accumulated labor income of farm girls at the end of age 18 amounted to only $820.

Summary of rearing costs. Table 2 summarizes the costs of rearing farm children in the United States, at price levels prevailing during 1954, for each year of age through 29, in a family of four persons. The expenses

wife. The added cost per child then diminishes as the size of the family increases. In this second method of analysis, certain living costs are considered as "overhead" costs that vary comparatively little among different family types. For example, expenditures for an automobile, household equipment, much of the home furnishings, and even of the housing itself are at least partly "overhead" costs.

In this paper, the "average cost" concept was used because no recent farm family-size scales based either on expenditures or income equivalents existed. The computations are based on actual estimated expenditures and not on any theoretical level of living.

[13] Farm children earn varying amounts of money at employment and many perform unpaid family labor. Their unpaid family labor contribution and wages from employment partially offsets the cost of their rearing. Since few farm children contribute all of their labor earnings to their parents for maintenance, the net expenditures borne by the parents in rearing and educating children are understated.

of rearing and educating boys was slightly more than that for girls. Counting the $255 expenses incurred at the birth of the child, it cost $501 to rear a farm boy to the age of one. Eight dollars less was spent on daughters.

Expenses were lower during the remaining preschool years of childhood than during the first year. They then increased at age 6 when the child entered school and reached a peak just before he left high school. The annual cost of rearing children increased to more than $1,000 per year before leaving high school; then the cost declined to around $800 annually.

Adding all costs of food, clothing, medical care, education, and other miscellaneous expenditures through age 18 brings the total cost of rearing a son to $15,281 and of a daughter to $15,178.

Since the labor incomes of girls were not comparable to that for boys, the net expenditures borne by parents did not reflect parallel comparisons. An analysis of the net rearing costs to parents shown in Table 2, was omitted because of this incomparability of data.

Four categories of expenditures were not included in the costs of rearing farm children: first, the monetary value of the mother's household labor; second, interest charges on expenditures for each child's maintenance; third, death losses of children; and fourth, the costs of certain public services, such as health and recreation, provided at public expense by taxpayers. Had these four types of expenditures been allocated, proportionally, to the individual costs of rearing each child, the total costs would have been larger than those in Table 2.

Conclusion

This research was animated by a belief that most farm families are hardly cognizant of the total economic investment that each child represents when he reaches the threshold of his earning period. The study has shown that an investment of more than $15,000, at prices prevailing in 1954, was required to rear and educate a farm child in the United States through age 18. The costs of rearing boys to this age was only about $100 more than for girls.

This study has also shown that the rearing expenses vary with the age of children. The annual costs rise year by year after age one and reach a peak in late adolescence just before they complete high school. At ages 17 and 18, when there is a heavy drop in educational costs due to high-school graduation, the costs drop for both boys and girls.

NOTES

IMPROVEMENT OF LIVESTOCK AND GRAIN MARKET REPORTS[1]

W. K. McPherson
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PROFESSOR McCORMICK'S penetrating and competent analysis of livestock and grain market reports[2] was largely based on primary data collected in Ohio. Ohio is located in, and is generally typical of, the most concentrated livestock and grain production area in the country—the Midwest. It is in this area that his recommendations for improving the market reports on these commodities will be most useful. But—with some refinements and/or alterations—the recommendations can also be used in the much larger geographic area that surrounds the Midwest.

The structure of the markets for livestock and grain on the periphery of the concentrated midwestern production area differs from the market structure prevailing within that area in the following respects: (1) There are relatively few livestock and grain terminals outside the Midwest. Consequently, the alternative of selling through terminals rather than local centers is not readily available to most farmers outside the region. (2) The proportion of the total volume of trading in livestock and grain that takes place in terminal market centers is relatively small.[3] For this reason market news reports from terminal market centers outside the Midwest are less reliable than terminal market reports in Chicago, Kansas City, etc. Actually transactions at the terminals are so well reported that information originating from these sources has a great influence on the prices paid in local transactions. For example, traders use terminal prices as a basis for consummating a local transaction simply because no other information is available, rather than because it is a good indicator of the price in the entire market. Although it would be highly desirable to improve the quality of the market news reports from terminals in the Midwest, these improvements would not contribute very much to making market reports outside the region more accurate or useful.

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[1] Florida Agricultural Experiment Station Journal Series, No. 405.

[2] Francis B. McCormick, *Journal of Farm Economics*, Vol. XXXVII, No. 3, August 1955, pp. 461-470.

[3] For example, there are four public stockyards in the southeastern states (an area that is larger than the midwestern production area) and on any given day the volume of trading in any one of these terminals may be smaller than in some of the larger local market centers. For example, Monday, July 11, 1955, receipts of cattle and calves at Montgomery, Alabama, totaled 450 head, whereas receipts at Gainesville, Florida, on the same day totaled 1036 head and at Belle Glade, Florida, 1040 head.

(3) Outside the Midwest, the production of livestock and grain is widely scattered. Consequently, the volume of livestock or grain that can be economically assembled in any one local market center is relatively small. Furthermore, these local centers are located so far apart that many farmers cannot choose among two or more places when they are ready to sell. Whereas midwestern farmers can choose between any one of four or five and often more market centers on the basis of price, farmers in other parts of the country must accept prices paid locally regardless of whether or not they are comparable with prices being paid elsewhere in the market. In other words, on the periphery of the midwestern livestock and grain economy, the market for these commodities is so decentralized that gross defects develop in those segments of the market[4]—defects that an effective market news service can help correct.

Whether or not Professor McCormick's suggestions on how to improve in the coverage and quality of reports from local market centers for these commodities can be used effectively on the periphery of the midwestern livestock and grain economy depends upon the organization of the local market centers in these areas, and upon the extent to which local market information is now being reported.

Local market centers may be either organized or unorganized. Organized market centers exist (1) when several buyers and sellers assemble for the purpose of trading, (2) when any one is free to participate in the trading, and (3) when all traders have at least a general knowledge of the price at which all transactions are consummated. Auctions, state farmers' markets, etc., are examples of organized local markets. Unorganized market centers are those in which only one buyer (or seller) trades with many sellers (or buyers) at any given location, and the price at which this buyer (or seller) consummates transactions is not made available to the public. Packers that buy cattle and hogs directly from farmers are frequently (but not always) typical unorganized market centers. No doubt those who trade in unorganized local market centers use reports from organized market centers as a basis for making a decision to trade. Thus, traders at unorganized market centers use the devices society has created to make the economy competitive (market news reports) but contribute nothing to making them effective (i.e., making them more complete and accurate).

In contrast to the situation that exists in the Midwest, most of the livestock and grain market reports that become available in the southern

[4] For example, the price of high-grade cattle falls as much as $5 per cwt., or 25 percent below the true market price. See the author's article in the current issue of this *Journal*.

states originate in organized local market centers. This is particularly true in the case of livestock market news reports in Florida. Here the Florida State Marketing Bureau and the United States Department of Agriculture conducted experimental work on reporting prices paid for livestock at three auctions in the late 1940's, initiated regular market news reports on seven auctions in September 1948, and now publish reports on 16 auctions that handle more than 75 percent of all cattle and calves sold at organized market centers in the state. In fact, prior to December 1955 all of the livestock market news reports originating in Florida that were identified with any geographic area smaller than the state originated in these local market centers. Reports on direct sales were initiated in December 1955.

Because organized local market centers are a relatively more important source of livestock and grain market information on the periphery of the Midwest than within the region, Professor McCormick's suggestion for improving market news originating from these sources is even more applicable outside that region. This is especially true since some grades of some commodities are not traded in sufficient quantities at local market centers to establish reliable price quotations.[5] For example, prices discovered in local auctions for low-grade cattle are reasonably representative of prices in the national market. On the other hand, prices paid for high-grade cattle in the same local auctions are well below the national market, largely because the volume of trading in these grades is small. In these instances, the defect in the price discovery mechanism is largely due to the fact that some sellers do not know that the prices paid for high-grade cattle at local auctions are frequently low. More complete market information from local sources would reveal the volume of trading in each grade of livestock and point out instances in which the volume of trading was too small to establish a reliable price.

The most urgent problem confronting those endeavoring to improve livestock and grain market news coverage lies in obtaining information on the volume of trading and on the prices for transactions consummated in unorganized local markets—commonly called direct sales. For more than a quarter of a century, the number of local market centers at which livestock and grain are traded have been increasing. Furthermore, marketing economists are in general agreement that the proportion of transactions taking place in these unorganized market centers is increasing, but most of their efforts to evaluate the volume of these sales quantitatively have been unsuccessful.

Estimates suggest that direct sales of livestock are proportionately

[5] W. K. McPherson, *op. cit.*

greater outside the Midwest than within that region.[6] If this is true, the need for developing methods of reporting unorganized market centers is most crucial on the periphery of the midwestern livestock and grain economy. Professor McCormick recognized the general proposition that more information is needed on direct sales but he did not evaluate the importance of this need in the two areas or examine the current weaknesses in direct sales market news. Since the proportion of direct sales to the total sales in the entire market appears to be increasing, the importance of collecting and disseminating market news in the entire market is also increasing.

As Professor McCormick points out, the USDA and some of the state marketing agencies have been publishing a limited amount of information on direct sales of cattle. The Thomasville, Georgia, report originates outside the Midwest and reports some information on direct sales to southeastern packers. This report is better than none at all but it does have two distinct weaknesses: (1) The price quotations on direct sales are generally not tied to specific geographic locations. (2) No information is given on the volume of animals upon which each quotation is based.

These observations should not be construed as criticism of personnel in either the federal or state market news agencies. Instead, it rather clearly suggests the need for more research of the type Professor McCormick is doing and, as he suggests, inaugurating some "pilot" studies designed to develop a new procedure for reporting market information.

Finally, Professor McCormick's suggestion to educate personnel associated with various media of dissemination is an excellent way of making market news more readily available. This will probably be more effective in the Midwest than elsewhere in the livestock and grain market. The reason for this lies in the fact that radio and newspaper executives are not very "market news conscious" outside the midwestern livestock and grain economy. In Florida they argue that since only about 10 per cent of the reading or listening public are farmers and less than one-third of the farmers produce livestock or grain for sale, they cannot afford to allocate much time or space to livestock and grain market news. Consequently, only three daily newspapers endeavor to give comprehensive market news information on livestock transactions

[6] E. Farstead, *Margins for Marketing Livestock from Farms to Slaughter Plants and Feed Lots*, U.S.D.A., B.A.E., 1949, found that 23 percent of the slaughter cattle and calves were sold direct in the United States whereas Frederic T. Thomsen, *More Efficient Marketing of Arizona Cattle*, Bul. 254, Arizona Agr. Exp. Sta., Tucson, 1954, found that more than 80 percent of all fed cattle in Arizona were sold direct to packers. In Florida it has been estimated that as much as 50 percent of the slaughter cattle may be sold direct.

within the state. Radio coverages of market news is only slightly better. In fact, the issue is so clearly drawn that the owners of newspapers and radio stations have suggested that, if it is in the public interest to disseminate market news on these commodities, newspapers and radio stations should be paid to do it.

RESEARCH ON THE DYNAMICS OF THE FARM MANAGERIAL DECISION PROCESS

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THE purpose of the seven-state managerial study of 1,100 single-family farm units is described by Glenn L. Johnson[1] as a study "which examines types and sources of information and *thought processes* used by farmers as well as the different states of knowledge they hold, the *strategies they employ* and the utility they attach to gains and losses in income." (The italics are mine.)

This study is a recognition of the need for research designed to gain an understanding of the decision processes involved in managing the farm enterprise. This recognition is an important milestone in farm management research. The results of sound research on the farm managerial decision process will make it possible to increase the effectiveness of extension work in farm management, especially in carrying out the joint farm business and home planning extension program.

In the light of our experience with survey research on an analogous problem outside the farm management area and my own earlier experience in farm management research, I would like (a) to comment on the methodology used in the seven-state managerial study, and (b) to make suggestions regarding methodology for further research on the dynamics of the farm managerial decision process.

I believe that our experience in buying-decision research provides a basis for a critical evaluation of the seven-state survey and for making sound suggestions for future research in this field. Perhaps a few words on our buying-decision studies would be appropriate at this point.

For more than two years National Analysts has been pioneering in consumer dynamics research for the Advertising Research Foundation

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[1] Glenn L. Johnson, "Production Economic Analysis," *Journal of Farm Economics*, Volume XXXVII, Number 2, May 1955. This comment is also based on seven papers on "Progress and Problems in Decision Making Studies," *ibid.*, Proceedings Number, Vol. XXXVII, No. 5, December 1955.

and other clients. Out of this research has come a valid and practical approach to gaining an understanding of the *buying-decision process* on the part of consumers. The results of this buying-decision research provide a basis for more effectively directing the educational, promotional, advertising, marketing, merchandising, and sales activities and sales training of a firm desiring to increase sales volume of its products or services in the national market.

These buying-decision studies are designed to ascertain the types and sources of information and thought processes used by consumers in the buying-decision process; their states of knowledge, reservations, expectations and motivations concerning the product under investigation; and the influences that affect the decision from the first awareness of need until the purchase is actually made. This study purpose is similar in principle with the objectives of the seven-state study of the dynamics of the farm managerial decision process as stated by Johnson. In fact, many of the important farm managerial decisions involve the purchase of farm production items such as land, farm machinery, breeding stock and fertilizer.

When we undertook the developmental work in consumer dynamics research we recognized the social-psychological aspects of the problem as well as the economic and statistical. Our first step was to employ the services of two of the best-trained and experienced university social psychologists we could find to work with our own staff of economists, statisticians and psychologists. Considerable experimental testing of various approaches was necessary to develop the interviewing procedures required to get the information from respondents that would give us an understanding of the buying-decision process for various kinds of products.

Before commenting upon the questionnaire used in the seven-state farm managerial decision process study I want to assure you of my deep interest in this kind of research and my desire to see further research in this field developed along lines that will lead to useful results.

The Farm Managerial Survey

The section of the questionnaire on "Price Expectations" should produce some information that would be safe to use and interpret. Similarly much of the factual information about farm managerial practices will be usefully indicative of what farm management decisions have been in the past and might well reveal some suggestive patterns relating to what it might be in the future.

Looking at the study as a whole, however, the *conception of the study* seems to us to be faulty in two major respects. In the first place,

the study assumes that the decision process is an *individual one rather than a social one.* In certain instances, it may be primarily individual in nature. But as we know from other research, much more commonly, it is a social process involving what might be called a "spending unit" rather than a "spending individual." Ordinarily this "spending unit" would include at least the other members of the family who are likely to have more or less to say about almost any decision concerning the management of the farm. We would not suggest that the research should have been started with the presumption that all the decisions would be social in nature. Rather it is my feeling that the degree to which any particular decision is either social or individual is a matter for research determination.

This conception of the farm managerial study prevents this study from bridging the earlier sharp distinction between the farm firm and the farm household made by both agriculture economists who draw on early classical economic theory and by empirical farm management workers, mentioned in the article by Glenn L. Johnson in the May 1955 *Journal of Farm Economics.*

Incidentally you may be interested to know that we have learned from a recent farm study that both the farm operator and his wife *recognize* that important *purchasing decisions* for certain capital goods are "family-group-centered" with more than half of the farm families. I wish I were free to tell you more about this study. It is quite likely, however, that the degree of family influence decreases as we proceed along the scale from the subsistence or part-time farm to the larger more strictly commercial farm enterprise.

The second major conceptual defect lies in the fact that it imputes decision processes to the individual that are of a nature foreign to the best findings in psychology. Implicit in the whole study is the picture of a man as a consistent weigher of advantages and disadvantages primarily economic in nature; a man who is not apparently subject to the lingering effects of disappointment, anger, prejudice, unreasoning stubbornness, neurotic fixation, likes and dislikes for things both animate and inanimate. We do not wish to overemphasize the irrational side of man in his choosing of courses of action, but to ignore it is to ignore the major advances in psychology and psychiatry of the past 50 years or more.

In studying the questionnaire for this study it is apparent that some of the questions are phrased in terms of an abstract managerial decision process, or some other abstraction that is equally generalized and lacking in specific reference. Alternative answers from which the respondent *must* choose are based closely upon the questionnaire authors' precon-

ception as to what the managerial decision process *must* be like. Consequently, the respondent is left with a list of alternatives that probably do not even approximate his experience and he must choose among alternatives, any one of which will substantiate the original hypotheses implicit in the questionnaire. For example, Question 11 appears to presume that a farmer will use some mathematical method for figuring out how to expand his hog enterprise. If he rejected the two mathematical procedures offered, and said he just made a vague guess or went on the advice of "Joe," he would be exposing himself to ego damage. There, of course, may have been a more subtle reason for such a question of which we are not aware.

Question 9 is an example of vagueness of alternatives offered. The respondent is given a list of problems and asked to say which of these or any others have been problems in his experience. The list includes such things as "recognizing the existence of problems" and "defining the objectives of your family." The first of these implies a degree of sophistication that generally speaking is present only in the academically educated and has only become widespread among them since the time of Freud. One of the most difficult problems in clinical psychology is to get a patient to recognize the fact that it is possible to have problems even though one does not recognize their existence. This is true, generally speaking, even with respect to well-educated people. As to the second one, I would like to ask "What are the objectives of your family?" "Do you have trouble defining them?"

The questionnaire construction suffers further from the use of words that are not commonly understood. As an example, Question 5 gives as one of its alternatives "political, social, religious factors" and further talks about "formal and informal groups." The meaning of "factors" in the sense intended could very well be included as part of a fairly high-level vocabulary test. The meaning of "formal and informal groups" as intended in the questionnaire, generally takes several lectures to make clear to college students in introductory courses in sociology or social psychology.

A general finding of survey work is that when a respondent is presented with alternative answers that he does not understand, *this seldom prevents him from choosing one of them.* There are many reasons for this: he may want to conceal his own ignorance; he may want to build up his ego; he may want to be obliging; he may perceive a familiar bell, he feels that he understands the whole thing; or he may wish to avoid the prodding and pushing of the interviewer, which he finds is a consequence if he reveals that he doesn't understand or doesn't know which of the alternatives to choose.

For these and other reasons, almost all surveys of this kind will turn up with systematic, and, very often, reasonable and consistent-looking results. The tendency, then, is to interpret them, generalize them, and build a big theory on them; or else use them as evidence for the theory that was already built into the survey in such a way that little other than confirming evidence could emerge.

Methodology for Further Research

Rather than to make an over-all survey approach to the study of the farm managerial decision process designed to test high abstraction level and generalized hypotheses arising primarily from concepts of the "economic man," I would suggest a survey approach designed to discover what the decision processes actually were, when fairly recent important individual management decisions have been made. With this approach we would trace through *one kind of decision with one respondent at a* time for the purpose of ascertaining the following:

(1) *who* in the farm household participates in the decision process,
(2) the relative importance of the role of each member of the household involved at different steps in the decision process,
(3) the bearing of previous experience with similar decisions on the decision under investigation including expectations and their fulfillment,
(4) the kinds and sources of information utilized; how used; and why,
(5) the influences outside the household group that affected the decision.

The kind of management decisions selected for study would be traced through the decision process from the first awareness of need for making the decision until the decision was actually made.

Considerable developmental work would be necessary to determine questions that would get the required information. This developmental work would start with largely unstructured recorded interviews by experienced interviewers with adequate training in social psychology. Ultimately a questionnaire would be structured that could be used effectively by experienced interviewers such as we use for our national buying-decision studies on a probability sampling basis. Part of the field interviewing would be with farm operators and part with the operator's wife and perhaps other members of the farm family.

There are so many decisions involved in operating a farm that I believe an order of priority of the decisions to be investigated should be worked out. In establishing this priority I would suggest decisions involving the purchase of important production items such as (1) addi-

tional farming land (or the sale thereof), (2) a farm tractor and major implements, (3) commercial fertilizer, and (4) a herd sire or other breeding animals.

These kinds of decisions are suggested because I believe that the technique we have developed for gaining an understanding of the buying-decisions process of certain consumer items would be useful in getting a sound start with this kind of research. Some modifications in these techniques may, of course, be required depending upon the kind of decision being investigated. But I believe that our social psychologists who have developed and validated these techniques for marketing research are sufficiently capable and flexible to develop and test the necessary modifications in cooperation with the agricultural economists and others responsible for farm managerial studies.

As experience is gained from a research program focused on the above suggested kinds of decisions, the program could be extended to other important kinds of farm managerial decisions such as increasing or decreasing the acreage of major crops, the number of sows to farrow on the farm, cattle or lamb feeding, changes in the beef or dairy herd or the poultry enterprise, when and how to market hogs or cattle, and the like.

The results of this kind of research should prove to be cumulative. If the results of this research on individual decisions are a reliable guide, they should lead to valid generalizations concerning the personal and social nature of the farm managerial decision process, either as a whole or more likely by kinds of decisions. To reach such generalizations will require much time and intelligently-directed effort on the part of agricultural economists and social psychologists experienced in how to extract reliable information from farm men and women.

I believe that a sound research program on the Dynamics of the Farm Managerial Decision Process will provide information that can be used effectively by the extension service and other agencies to materially influence a more efficient and profitable American agriculture.

A REJOINDER

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ALTHOUGH the writing of rejoinders offers no chance of gain to those reporting research, we feel that Charles Sarle's discussion of the papers reporting aspects of the Interstate Managerial Survey

requires a reply. Publication of his discussion creates a real need to reclarify the view of the study held by readers of this *Journal*. In carrying out this objective, we should like to discuss Sarle's actions and qualifications as a critic as well as certain of his specific points.

A general evaluation of his remarks must start with a realization that, unfortunately, he is not well acquainted with many important aspects of the study. Specifically, he has not seen (1) the schedule forms that were used in the field (he has seen the master list of questions from which six different field schedules were built), (2) either a list of hypotheses being tested in the study or a list of reasons for asking the questions on the schedule, (3) the pretest results, (4) the operation of the interviewer training school, (5) the code books, and (6) any interpretations of the tabulated data.

It is also necessary to point out that Sarle's experience in consumer-purchasing research and in the field of farm management would not necessarily qualify him for a critic's role even if he were more fully informed about this project. We say this because (1) Sarle's experience and interest in consumer-buying research may be quite different from that required to evaluate this project. Decisions to buy consumers goods, say a TV set or box of corn flakes, often occur under different conditions than farmer decisions to adjust feeding rates in response to price changes or to get into farming. Moreover, those doing *commercial* research on consumer buying are interested primarily in information profitable to clients while our research, on the other hand, is oriented toward improving our understanding of decision making under circumstances that make any research outcome of interest acceptable. (2) The rapid rate of development in farm management research since World War II raises serious questions about earlier professional farm management experience as a qualification for evaluating current projects.

On a general level, Sarle's discussion represents, in our view, a poor execution of the discussants role. It is an imagined version of our total project, rather than facts about the project presented in our limited papers, which is evaluated. We feel that a discussant should limit himself to an evaluation of what is reported. Although this function may lead him to note omissions in the reports, the consequence should be a request for answers to additional questions raised by the reports rather than a criticism of selected conjectures as to what these answers might be.

Despite Sarle's limited knowledge of the project, his somewhat dubious claim to the role of critic and the way he elected to play a critic's role, certain of his points must be answered. The interests of personnel and research agencies in seven cooperating states must be protected by our

insisting that the project be evaluated on the basis of what has been done to date rather than on the basis of conjectures about what may have been done in the past and will be done in the future.

1. Contrary to Sarle's assertion, we do not view decision making solely as an individual act—to do so would exclude from consideration all who influence the respondent directly, or indirectly either as models, ego ideals, or as members of reference groups. If Sarle were more fully informed about the study, he would know that we have much information on group influences in response to open-ended and projective questions.[1] Even the control questions place heavy emphasis on family composition, off-farm experience and education. While we may have underemphasized group influences somewhat, such underemphasis does not detract from other types of information gathered.
2. It is charged that we assume a decision maker to be "a consistent weigher of advantages and disadvantages—primarily economic in nature." Is this Sarle's definition of rationality? He implies that on the contrary men are often irrational and make decisions which reflect "anger, lingering effects of disappointment, prejudices, unreasoning stubbornness, neurotic fixation and likes and dislikes." We agree with Sarle and want to point out that many of our questions elicit descriptions of such decisions and that our codes are designed to record such influences.
3. To our knowledge, no question on the field schedules forces substantiation of any hypothesis being tested. Question 11 on the master list of questions appears to have been singled out for such a charge in this version of Sarle's paper and definitely was in earlier versions, one of which was read before the Association. Question 11 is not designed to test the hypotheses that farmers reason mathematically. Instead, it trys to find out if farmers can use and understand either or both of the two models. Both the question and code are designed with this objective in mind. The fact that we have asked questions about alternatives farmers do not practice does not mean we are preverifying hypotheses that farmers use such practices.
4. To prevent forced substantiation of theoretical classification and categories, the ordering of questions in the field schedules (which Sarle has not seen) was carefully considered. Unstructured questions designed to test the completeness of theoretical classes and categories always precede specific or leading references to them.

[1] At a later date, field schedules and code books will be available to interested persons to permit them to check this and subsequent statements about the nature of our material. Meanwhile specific questions can be answered by letter.

Questions making specific reference to theoretical classes and categories are used to determine if such classes and categories can be used or be understood by farmers.

5. With respect to question 5, pretest results did not indicate difficulty with such expressions as "political, social, and religious factors" and "informal and formal groups." Interviewer training and visual aids supplied to respondents were helpful in this connection. Although Sarle may be surprised to find this out, the words "religion," "political" and "social" are quite familiar to farmers and apparently help them to define the term "factors" in context.
6. Sarle seems to be criticizing a number of our questions because he feels farmers are forced to make choices they do not understand. Forced choices among alternatives not understood should yield random rather than "systematic, and very often, reasonable and consistent looking results." Sarle's description of results might apply to *post factum* interpretations of the data on our part. As we have not yet undertaken interpretive analysis, we would welcome a crystal ball as clear as his must be.
7. There seems to be an implicit charge in Sarle's paper that we have ignored social psychology both substantively and methodologically. Such a charge is probably based on the misconception that social psychology is a unique discipline with substance and techniques of its own. Social psychology is not a discipline with unique substance. It is, rather, a viewpoint that sees both individual and group factors as impinging on the actions of persons. Within this broad common viewpoint there are widely varying positions on the relative weight of these factors and other matters. Freudianism is only a position of one school of social psychology. Social psychology has no system of research techniques peculiar to it. Its techniques are all borrowed or adapted from either psychology or sociology. What is borrowed and how it is combined methodologically are largely functions of the school of thought to which the social psychologist subscribes. We assert that a systematic examination of our field schedules, interview training procedures, and codes will reveal much attention to both group and individual factors in decision making.

We would also like to make a comment about Sarle's viewpoint on further research on the dynamics of the farm managerial process. It appears to us that no science or academic discipline can dominate the study of management or decision making. Management handles problems that can be defined as difference between concepts of

"what is" and concepts of "what ought to be." Changing "what is" may involve any science and all degrees of inventiveness. The discovery of new values and interrelationships among values involves philosophic value theory, ethics, and theology. Thus, the range of disciplines needed in studying the procedures management uses in solving its problems is so large that it is futile to depend primarily on any one or any two disciplines. This holds for economics alone or for sociology combined with psychology as well as for any other single discipline or pair of disciplines.

Incidentally, it is also apparent that the "bridge" between dynamic production and consumption theory and between means and ends in farm-home managerial problems need not necessarily involve group or family-centered decisions. Ends (including subjective ones if there are any other kind) and means must be reconciled in all problem solving.

8. Many of the sins with which we are charged seem to be sins of omission. We feel that such charges are reflections of a view that a study of a broad problem area can be complete and definitive. We reject this view. It is our hope that we will be able to continue to study aspects of management in the future and that the charge "you've left something out" will not be raised with each future report.

COMMENTS ON THE REJOINDER

CHARLES F. SARLE
National Analysts, Inc.

THE older agricultural economists are aware of my long abiding interest in and activities toward improving socio-economic survey research procedures. Early in my career—after several years' experience with farm management surveys in New York, New Hampshire, West Virginia and Iowa—I left this research field in part as a futile protest against the survey procedures I was required to use. Now, many years later, I am again protesting some of the survey procedures used in the seven-state survey because I believe research designed to gain an understanding of farm managerial decision making is probably the most valuable research that agricultural economists could be doing today.

I also believe that our experience at National Analysts in developing effective interviewing and other survey procedures for gaining an understanding of consumer buying behavior provides a basis for making useful

suggestions for future research on farm management decision making—the primary purpose of the paper I presented at the meeting of the American Farm Economic Association last summer. If one is to make suggestions for improving research procedures one must first point out what procedures need to be improved and why.

Incidentally, the paper I read before the Association session is the *same* paper that appears in this issue of the JOURNAL. Before starting to read it, however, I did compliment the committee on their use of an area probability sampling plan. I also pointed out that using agricultural economists as interviewers was a potential source of nonsampling errors or bias in the study results.

Although I do not feel informed concerning "the rapid rate of development in farm management research since World War II" that Drs. Johnson and Smith mention in their rejoinder, I do believe that I have kept fairly well abreast of important scientific developments in interviewing procedures and the wording and ordering of questions, particularly in research in the field of decision making. The developmental research on the buying-decision process that we have done at National Analysts over the last several years is recognized as being outstanding by the Advertising Research Foundation of New York, a nonprofit research organization.

So far as National Analysts' commercial research is concerned, it is definitely oriented toward gaining an understanding of a given research problem which will enable our clients to increase the efficiency of their operating policies and practices. If we fail, this research is not profitable to them and we do not continue in business. Just "any research outcome of interest" is seldom acceptable to a client.

Consequently, we have to make use of the latest understandings of the principles, methods and procedures of several disciplines including sampling and analytical statistics, economics, *sociology* and *psychology*. We employ and use the most outstanding specialists in these several fields that we can find. In the last year and a half we have added five well-trained sociologists and psychologists with years of experience in socio-economic survey research. Of our present professional staff of more than 20 persons all but one came to us with a substantial background of research experience in universities or government or both. Effective interdisciplinary socio-economic survey research is essential to our survival. The research foundations are endeavoring to stimulate more effective interdisciplinary research in the social sciences at universities.

A careful review of the six different field questionnaires actually used in the seven-state study only confirms my evaluation of some of the questions as not providing effective *communication* between the researchers

and farm-operator respondents. This is not an unusual occurrence by any means. We know from long experience that only by careful developmental research by trained social psychologists with considerable experience in socio-economic survey research and repeated field testing, can such questions be held to a minimum.

Two of the basic requirements of sound socio-economic survey research are: (1) the closest practical approach to a strict probability sample of the population of interest as the available budget will permit, and (2) a questionnaire with questions that are so worded and ordered as to provide the most effective possible means of *communication* between the researcher and the respondents.

Several years of intensive research by competent statisticians and others were required to learn how to design and use an area probability sample of farmers. Improvements providing greater statistical and operational efficiency are constantly being made. Since the late 1930's sources of nonsampling errors due to questionnaire design, interviewing procedures, interviewers, coding and the like, also have been researched intensively by certain social psychologists and others.

More rapid progress has been made in sampling design, primarily, I believe, because it is basically a mathematical problem and also because of the earlier statistical work of Professor R. A. Fisher. Except perhaps for Dr. Rensis Likert, there has been no pioneer in the psychological field comparable to Fisher in mathematical statistics. Social psychology, being a less exact science, provides a much less sure foundation on which to build effective interviewing procedures. Consequently, intensive scientific developmental socio-psychological research on questionnaire design is necessary especially when survey procedures are being adapted to new and complex problems such as decision making.

Frankly, I am surprised that Drs. Johnson and Smith feel so strongly that– "the interests of personnel and research agencies in the seven cooperating states must be *protected*. . . ." I have the highest regard for these people and institutions. I believe they are definitely interested in improving their survey research procedures. I also believe that one does not have to know *all* about a survey research project to be able to point out needed improvements in questionnaire design when one can look over the questionnaire.

Even at the risk of precipitating more rejoinders, I would like to comment more specifically on several of the other points raised in the rejoinder to my paper.

1. We have found in our buying-behavior research that we get a more accurate understanding of the decision making process–the relative

importance of the roles of the two or more members of the family group, the influence each has in the several steps of the decision process, awareness of need for additional information, the sources to which they turn, and other influences—by separately interviewing both husbands and wives, but not necessarily in the same household.

2. Researchers' hypotheses and reasons for including various questions have no bearing on how respondents understand questions; that is, on the effectiveness of the communication process in the interview situation.
3. Thorough interviewer training schools are, of course, essential. However, such schools cannot begin to offset those questions that are directed toward a higher level on the "abstraction ladder" than many of the respondents in a probability sample are accustomed to thinking, or that are outside the scope of their perceptions.
4. When questions are not formulated in terms of the respondents' perceptions you will usually get some kind of reply, whether the respondents be American, Turkish or Japanese farmers. No amount of *coding* can put reliable meaning into these answers. When questions are so involved that they require explanation by the interviewer, various interpretations that are a source of bias are inevitable.
5. Using agricultural economists as interviewers on this study is another potential source of bias, particularly in the recording of open-answer and probing questions regarding economic behavior. Why? Because economists are more likely to read more economic behavior into these replies they record than will interviewers who are accustomed to recording replies as nearly verbatim as possible.

In view of the high abstraction level of some of the important questions, this seven-state study runs the severe danger of being considered extremely successful because it provides intellectual exercise and builds theories. Perhaps this is fine as long as people do not apply this structure to concrete cases of farmers adjusting feeding ratios to price changes, buying fertilizer, a herd sire or a tractor, or getting into farming.

I would like to see future research in farm managerial decision making undertaken somewhat along the lines suggested in my paper—the part that was not mentioned in the rejoinder. For example, I cannot visualize a more challenging and worthwhile research project than one designed to gain a sound understanding of the decision making process of farmers when they overincrease and overdecrease their number of sows farrowing on their farms, and what could be done to get farmers as a group to level out the extremes of the hog production cycle. Certainly an interdisciplinary approach to such a problem would be needed.

PROFESSOR GALBRAITH ON FARM POLICY

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THE analysis of the current position of farm policy by Professor J. K. Galbraith published in the May 1955 issue of this *Journal* minimizes the significance of the Agricultural Act of 1954 and proposes a change in methods of support as a more effective means of dealing with the surplus problems of agriculture. I cannot follow the analysis to the conclusions reached by him. I submit that the action taken in 1954 to adjust supports to a postwar peacetime basis was a step in the right direction. The criticism that the action was too timid may be granted without therefore concluding that the methods of support must be changed.

The change in methods of support from loans and purchases to payments is proposed primarily to deal with the problems of foreign and domestic trade. Incidentally, it would also lessen and make possible the elimination of discrimination in support programs. Galbraith admits that the proposed change would not solve the problems of surpluses and production control. He also admits that there are other disadvantages and objections to the alternative method of support. He does not admit higher cost to the government that seems to me inevitable. On balance this analysis seems to me more confusing then enlightening.

I submit the alternative propositions (1) that price support levels should be adjusted to about "normal" price levels and (2) that the methods of support should be adapted to the characteristics of the commodity as to elasticity of supply and demand as well as to storability, the variability of the market, and other significant factors in market prospects.

I assume that the primary objective of national farm price policy is to stablize farm prices and incomes while maintaining production sufficient to meet current needs at a minimum cost to the government and to consumers. Conceptually, this requires programs that contribute to stabilizing the prices of the several farm products at about their respective normal price levels. The concept of stabilization does not require price fixing at any particular level but a reduction in variations, eliminating the extreme highs and lows.

War conditions required an expansion of many lines of farm production but conditions now point to the need of readjustments in production. Price supports were raised and in some cases additional incentives were offered to secure needed expansion in production during the war and for some years after the war, but now needs are adjusting to postwar reorganization of production and markets.

It follows that continuing price supports at a level so high that production continues in excess of current and prospective needs results in resources being wasted and the products costing consumers and the government too much. Temporarily, production restrictions may be justifiable as a means of stabilizing production and encouraging adjustments; but the continuous use of restrictions to lessen the cost to the government tends to maintain cost to consumers, and is likely to be wasteful of resources. The modernized parity formula together with the several price support schedules related to the volume of supplies was designed to provide for price support adjustments in the direction of permitting the operation of market prices. The legislation of 1954 was a first step in permitting postwar adjustments in the price supports of some of the basic commodities in the direction of the market level of prices for peacetime production. I submit, therefore, that the Act of 1954 was a significant step in the right direction. To the extent that price influences production and consumption the subsequent downward adjustments in support levels will contribute toward solving three of the four problems that Galbraith considered most important.

As I understand the statement he does not deny or disregard the effect of price upon production and consumption. He does not follow some critics in stating that reducing prices will cause farmers to produce more. He only argues that the actions taken and promised to date have been too timid. No significant relief is to be expected from them, therefore try another method of support. He seems to say continue these postwar high level supports, charge the cost to the U. S. Treasury and, if production continues in excess of consumption at these price levels to the point of costing too much, apply effective production controls.

The "Discrimination Problem" is not commonly considered to be an economic problem in a class with the other problems set out by Galbraith for special attention. The primary objective from the first has been to affect the whole farm economy through operation on a few commodities. Purchase operations have been extended to many commodities on a limited scale as emergency operations. But the heaviest concentration on storable commodities is certainly a logical approach to stabilizing prices and incomes. In the discussion of discrimination Galbraith neglects the indirect effects of the supports and controls of some products upon others. For example a very important incidence of the corn program operations is upon livestock production, especially significant in the fact that stabilizing corn prices contributes to the stabilization of hog production and prices. Corn support prices may be close to equilibrium and there is hope that we may escape both surplus accumulation and regimentation. These desirable prospects for corn would be strengthened if

the wheat surplus could be cleared without further restrictions upon the acreage of that crop and without dumping the wheat surplus into feed bins. I submit that more rather than less discrimination in support programs is required for the efficient use of resources.

I would remind Galbraith of the significance of the two important cases of potatoes and eggs in which supports have been abandoned because they cost too much and resulted in wastage of products. Would he recommend returning to support of these products by income payments? Since the supplies of these products are elastic and the demands are inelastic the cost of supports by payments could be very large. Would he try production controls? The conditions of production and marketing of these products are such that controls with continued high level supports would be practically impossible. The only practical approach to the price and income stabilization of such production is to place the supports below the surplus production incentive level and provide for by-product diversion of seasonal surpluses. I wish Galbraith had included an appraisal of the sugar program, which is support by income payments. Would be recommend it for universal adoption?

The payment method of support may be the more efficient method in cases in which the demand for the product is relatively elastic and the market supply inelastic. This method may be the best for some fruits and vegetables and some livestock products. The most significant test is in the increase in consumption response to lower market prices. However, even in the use of this method the level of support is an important consideration. It should not be used to perpetuate chronic surpluses. To do so would be wasting resources used in production as well as being an unjustifiable burden upon the Treasury. Nevertheless legislative authorization for the use of this method should be restored to be used with discretion.

In brief my conclusion from observation and analysis is that the most effective action in establishing sound farm programs would be to follow through the policy outlined in the agricultural acts of 1948, 1949 and 1954 of adjusting price and income support levels in line with expected market prices. Progress along this line would contribute to the solution of the problems of (1) reducing surplus production, (2) moving accumulated surpluses, (3) minimizing production controls, (4) increasing economic efficiency in the use of resources, (5) minimizing the exchange disparities, and (6) stabilizing the prices of and income from farm products. The problem of discrimination is not of major significance and may be left to administrative discretion under the terms of existing legislation. I concede one point to Galbraith: Legislation should be amended to authorize the payment method of support in cases in which that may be the most economical and effective method.

EXPERIMENTS IN FARM ORGANIZATION—NEW POSSIBILITIES FOR MORE EFFECTIVE FARM MANAGEMENT RESEARCH*

JOHN BLACKMORE, O. T. OSGOOD, AND ROGER WOODWORTH

FARM management research workers have long been envious of the experimental facilities available to their associates in the various production fields. The shining glassware, the pens of animals, and the neat plot layouts have often inspired a sense of frustration in those who study whole farms.

In recent years the analytical tools of production economics have made it possible for some economists to participate, along with production technicians, in experimental investigations of precisely defined production functions.[1] Such studies promise substantial contributions on many kinds of farm economic problems. Such investigations, however, although illuminating particular aspects of the management of a farm, do not deal with the final synthesis of the parts. Here we have relied upon budgeting and are beginning to use mathematical programming techniques.

Both of these techniques are forecasting devices and the estimates developed by either means are only as good as the assumptions and data used. In recent years we have made great strides in improving the quality and in increasing the quantity of technical data. Still, the product of such research remains as estimates.

On similar sorts of industrial production problems, engineers long ago learned to treat the conclusions of such analyses primarily as working hypotheses to be tested by the use of pilot production plants. From time to time proposals for the establishment of "pilot farms" have been made. Indeed, a number of experiment stations have used them in varying forms over the past 50 years. By and large, these proposals and trials have involved public ownership and operation or else a system in which income guarantees are offered to "practical" farm operators. The heavy costs of either land acquisition or income guarantees have discouraged use of the pilot farm device. Moreover, it has been argued that the findings on the publicly owned and operated pilot farms would be inapplicable on real farms where capital is limited.

Black and Wheeler have reported on the dairy farm project in the Northeast where production plans were made for each of a large group

* *Journal* Contribution No. 508, Mississippi Agricultural Experiment Station; *Journal* Paper No. 18, University of Georgia, College Experiment Station.

[1] See E. O. Heady and John Pesek, "A Fertilizer Production Surface," *Journal of Farm Economics*, Volume XXXVI, No. 3, August 1954, pp. 466-482.

of farms.[2] Some technical assistance was made available to the operators of these farms and careful observation was made of the extent to which the farmers adopted the plans.

For many years in some 20 or more states, extension services have been carrying on programs involving the use of test-demonstration farms. Almost without exception these have been considered as educational rather than as research devices. Recently, however, some attention has been given to the research possibilities inherent in this device. In Mississippi and in Georgia, small groups of test-demonstration farms have been selected for special research use.[3] The "special study farms" offer opportunities for meaningful farm management research without involving either the artificiality or the public costs of publicly owned pilot farms.

The projects consist of four related activities:

1. *Identification of modal farm situations.* Farms are selected to be typical as to soil conditions and size of a large number of other farms in an important physiographic area.
2. *Collection and adaptation of input-output data.* Results of experiment station production research are used as starting points. These projects have highlighted the gaps that exist in present data on production relationships. Of particular importance has been the discovery of needs for agronomic data relating to a wide range of soil conditions.
   A part of the work on these farms consists of plot tests of certain input-output relationships developed by research at central experiment stations but requiring adaptation to fit the wide range of soil conditions such as are often found on practical farms.
3. *The development and preliminary evaluation of production systems believed to have promise as means to such ends as increased farm income or soil conservation or both.* In both projects budgeting techniques are used to test alternative organization plans.[4]
4. *The practical evaluation of the system.* This includes gaining the operator's acceptance of the elements of the proposed production system and their installation on the special study farm. The farm management research worker, aided by production specialists and local extension workers, works closely with the farm operator in this stage. When necessary, some incentives, usually fertilizers, have been used to hasten the adoption of the proposed system. This work requires frequent contacts between research worker and farm operator over a period of from two to five years.

The work on these farms is in no way a substitute for fundamental

[2] J. D. Black and R. A. Wheeler, "Farm Planning, A Trial Operation," *Journal of Farm Economics*, Volume XXXVI, May 1954, pp. 198-209.

[3] In both states these are used in joint experiment station, extension service, TVA projects.

[4] In a somewhat similar project in North Carolina linear programming is being used for this purpose.

studies of technical relationships in agriculture or for studies of economic considerations in farm production. It is, on the other hand, a useful complementary activity, providing insights into those aspects of farm organization that do not lend themselves to study by other means.

In essence these farms are useful means for bridging the gaps that sometimes exist between production and economic research and between research and extension work. In both Georgia and Mississippi production specialists have participated in the work. In Georgia a technical advisory council has been set up for the project, with nearly all the production departments represented on the council. In Mississippi the cooperation of production specialists has been active but less formal.

In both states extension workers are participating in the work with considerable enthusiasm. The project brings research to bear on "practical" problems and the end products are readily accepted and incorporated in the extension programs. The special study farms in Mississippi in particular are used extensively for extension tours and demonstrations. The work is a much used source of input-output data for extension farm planning work.

THE LOOSELEAF REFERENCE BOOK: A SUGGESTED EXTENSION TECHNIQUE

JAMES D. SHAFFER
Michigan State University

A PRIMARY function of the agricultural extension service is to transfer existing knowledge of practical value in farming and farm living to farm people. This knowledge consists largely of a wider range of techniques of farming, marketing and homemaking. Many methods have been employed to fulfill this function. The purpose of this paper is not to evaluate these various methods but rather to suggest a technique that, if properly used, can contribute to a more effective extension program. The approach will be to consider some of the important factors that are expected to influence the effectiveness of extension teaching in the near future and to suggest a teaching technique consistent with these factors.

Some of the relevant factors appear to be as follows:

1. The average farm operator is becoming more literate and better educated. Senator Aiken has predicted that the average farmer of tomorrow will have the training of the average county agent of today. Although this is some time away there is no doubt that the average

commercial farmer of many states is sufficiently educated to obtain useful information from properly written material.

2. A technological revolution has taken place in communications since the start of the extension service. Not only is it possible to contact a large proportion of the commercial farmers by means of the mass media, including television with its vast unexploited educational possibilities, but the techniques of mass exposition and demonstration have been developed making highly effective communication with large numbers of people possible. We have discovered ways of making learning less painful.

3. From learning theory we know (a) that much of what we are exposed to is forgotten; (b) that learning is a *cumulative* process; and (c) that learning is more efficient when the learner is faced with a need for the knowledge.

4. Modern commercial farming requires a systematic, comprehensive and continuing education program in order to understand and keep abreast of changing economic and technical conditions. There is little or no continuity in present extension programs as far as the individual farmer is concerned.

5. Only a small percentage of the farmers in a position to benefit from a particular bit of information being disseminated by extension are likely to receive it due to the hit and miss system of distribution.

6. Information is seldom presented to the farmer in a form that is easily classified and preserved for future reference.

7. Resources for agricultural extension activities are limited and what resources are available should be used to disseminate available useful information to as many of the farmers as are in a position to benefit from such information. The information should be in a form most useful to the potential users within the limits set by the available resources.

It appears that the major responsibility of the extension specialists is to translate and present that part of the changing fund of agricultural knowledge that is of practical value in such a way to be most useful to farmers.

In view of the above statements how can this best be done?

The central core of the program suggested when the above factors are considered is a looseleaf source and instruction book. This book would be prepared by the extension specialists, would be accumulated over time and would be kept up to date through current additions and deletions as new and better information was revealed and as conditions changed. Releases should always be dated and contain the latest information as of that date.

The book would be accumulated or built in a logical order through

periodic releases, with the more specific information following the background information.

The reference book releases would always be coordinated with the other methods of communication. Every important addition to the book would be discussed on radio and television. An attempt would always be made to acquaint the farmer with the reference material in such a way that he would know where to look for specific information when faced with particular problems. Regular radio and television programs should be scheduled in advance and be advertised as covering a particular subject area jointly with the reference releases.

The presentation of the more important areas should be filmed and be made available through the county agent.

One advantage of such a program is that it would be clear what each specialist was doing and make it possible to avoid conflicting recommendations.[1] Similarly when all the subject matter presented to farmers is down in black and white in an organized system it would be much easier to see the areas needing more attention. It should also greatly aid researchers in determining the areas most needing work and in determining if the research has been properly interpreted.

The role of the county agent in this program would be to interest his farmers in this service and to help them use it. Many of the common questions asked the county agent would be answered by the reference book. This would free the county agent for more important work. One function he could perform would be adapting some of the reference material to the particular conditions of his county. The state specialist should also provide the county agents a supplement to the reference book especially designed for their use. It would be expected that almost every important bit of agricultural information not covered in the general reference book would be classified and kept current in the county agent's supplement. By having these two references the amount of time spent reading the great mass of miscellaneous material now poured on the county agent would be greatly reduced. If a county agent read everything sent to him now it would require all his time. Since he cannot read it all, or even a significant fraction of it, much important material must be lost to him. The supplemental reference would screen, classify, simplify and preserve all the current information of value to him. He should then have time left to provide the personal contacts needed to stimulate better farming through the use of better farming methods. He might

[1] The conflicting viewpoints would be out in the open. If they could not be resolved then at least an explanation of the reasons for the difference could be presented.

even have time to work with some of the low-income farmers having less education who would benefit least from the reference-book oriented extension program.

This program would compliment a program of farm and home planning. After the farm plan is initiated it is important to maintain contact and keep the farm family in touch with the latest advances with some indications as to how these advances can contribute to their farming operation. By using these materials as teaching aids and as future contacts the cost in terms of personal visits could be reduced greatly. Similarly the reference type service would get better general use by being introduced and used in the farm and home planning program.

Once such a plan is generally adopted the extension service could offer a considerable service by preparing materials generally useful in American agriculture and by acting as a clearing house for materials developed in one state that might be useful in other states. Perhaps a uniform classification system could be developed that would permit materials from the various states where appropriate to be used interchangeably, thus reducing preparation costs.

This program meets many of the requirements for an improved extension service. It provides continuity for individual farmers. It uses mass media to its fullest extent thus making it possible to reach large numbers of farmers with limited resources. It provides a readily available source of information that can be found when confronted by a particular problem. Finally it provides the systematic, comprehensive and continuing type of education required by modern farming in this rapidly changing world.

SEX AND BRAND-PREFERENCE

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A CERTAIN graduate student, discussing in his dissertation the variation in brand preference of men as compared to women, began with the bland and innocent statement: "There are some interesting differences between men and women."

Although any objective researcher would have to agree categorically with such a statement in the abstract, market research and advertising people have long been aware that it is equally true when interpreted strictly with reference to differences between the sexes in connection with brand loyalty. A recent study of consumer action in the purchase of fluid

milk through a supermarket in Indianapolis indicated that men displayed a significantly greater degree of brand preference than did women.[1] If this sample represents men in general, and if their reaction to milk is similar to their reaction to other products, there are wide implications with respect to advertising, sales display and technique, and even economic theory.

The study mentioned was simple and yet quite conclusive as far as the sample concerned. It was carried out in a single supermarket over a two-week period. The supermarket selected carried two brands of milk, each sold from the same refrigerated display case. Brand A usually occupied the first place in the display case with respect to the usual flow of traffic, and brand B second place. Neither brand was more difficult to reach than the other except that the customer came to one brand first, the other second. During the two-week period of the study the positions of the two brands in the display case were reversed according to a pattern selected at random and shown in Table 1. Thus, for half of the

TABLE 1. BRAND IN FIRST POSITION ON INDIVIDUAL DAYS OF THE INDIANAPOLIS STUDY

	Day					
	M	T	W	Th	F	S
First week	B	A	A	B	B	A
Second week	A	B	B	A	A	B

twelve-day period brand A was in first place, for the other half, brand B. The basis of the study was to determine if the position in the display case affected the quantity sold. If the same amount of brand A had been sold whether first or second in the case, one might conclude that brand preference was absolute. On the other hand, if brand A sold less when moved to the less desirable position, it would indicate that location had greater effect on some customers than did brand preference. To determine the quantity sold each day and to permit a breakdown of sales by the sex of the purchaser, the study was made by means of a motion picture camera operating at the speed of one frame per second and concealed so that photographs could be taken of the customers buying milk without their being conscious of it. Detailed study of the films made it possible to determine how much of each brand was bought by men and how much by women, as well as a number of other interesting facts concerned with the purchase of the product.

[1] Norman L. Alberts, "Location vs. Brand Preference for Milk" unpublished Masters Thesis, Purdue University, 1955.

TABLE 2. LOCATION EFFECT ON AND DIFFERENCES BETWEEN MALE AND FEMALE CUSTOMERS

	Customers purchasing					
	Men			Women		
	No.	%	Dif.	No.	%	Dif.
Brand B first	95	65	8%	112	66	23%
Brand B second	88	57		98	43	
		t=1.11			t=3.37*	
		t between 8 percent and 23 percent=4.22*				

* Significant at 1 percent level.

Statistical analysis of the results showed that men did not purchase a significantly different amount of a brand when it was in first position as compared with second position (Tables 2 and 3). Women, however, were more likely to be influenced by location. A statistically significant 23 per cent more women purchased brand B when it was in first position as compared with when it was in second. On a volume basis women purchased 18 per cent more of brand B milk when it occupied the first position as compared with the second.

One can speculate at length upon the reasons for these "interesting differences between men and women." Certain alternative hypotheses present themselves:

1. Men are instructed by their wives to purchase a certain brand. To be consistent, this would have to include the hypothesis that men who shopped for their wives were married to the women having brand preference.
2. Men, though receiving no instructions, believe their wives prefer a certain brand and try to please them by purchasing such a brand. This, of course, presumes that some men try to please their wives.
3. Men are more sensitive to advertising than women, thus believe one

TABLE 3. LOCATION EFFECT ON AND DIFFERENCES IN VOLUME PURCHASED BETWEEN MALE AND FEMALE CUSTOMERS

	Volume purchased					
	Men			Women		
	No.	%	Dif.	No.	%	Dif.
Brand B first	133	58	1%	162	62	18%
Brand B second	119	57		131	44	
		t=0.16			t=3.09*	
		t between 1 percent and 18 percent=7.87*				

* Significant at 1 percent level.

brand superior to another to a greater extent than do women.
4. Men have a more sensitive taste than women and actually prefer one brand to another in more cases than do women.
5. The container of one of the brands was more likely to attract men than women. (Neither featured pictures of handsome young ladies or anything else.)

A testing of some of these hypotheses might be fruitful. The weakness of the reported study is that it tells only what took place, not why. Yet many other so-called "brand preference" or "acceptance" studies show only what consumers reported as their actions or reasons, and may not really reflect what people did or why they did it. Use of an instrument similar to the "lie detector' in these types of studies might materially increase the ability to judge the reliability of the data.

If the differences between the sexes found in the above study are rather generally true, even among a limited number of commodities, the implications are far reaching. Advertising people are always interested in what type of people react to advertising and who is most likely to develop brand preference. Merchandising practices often differ widely among stores catering to men as compared with those catering to women, if the intensity of brand preference varies by sex.

Even in economic theory care would need to be taken. One might expect to find a more inelastic demand curve for individual differentiated products in a matriarchial society as compared with one ruled entirely by men. In fact, there may even be some elemental basis for the Robinson-Chamberlin debate after all!

Errata

The footnote 7 on page 458 in the article by Ezekiel Limmer, "Railroad Transportation of Florida Produce" in this *Journal*, August 1955, should read as follows:

$$\tfrac{1}{2}\left(t_r - \frac{a}{100\ b} + k\right)$$

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BOOK REVIEWS

Agricultural Resources of the World, Vol. 1 of Atlas of the World's Resources, William Van Royen, New York: Prentice-Hall, for the University of Maryland, 1954. Pp. vi, 258. $10.00.

If we may extrapolate the old saying "A picture is worth a thousand words" and a statistical map or graph is worth a thousand statistical tables, the *Atlas of Agricultural Resources of the World* is worth 338,000 statistical tables.

A generation ago V. C. Finch and O. E. Baker, working for their doctorates in Geography, prepared the first agricultural atlas, A *Geography of the World's Agriculture.* It was so valuable that the United States Department of Agriculture published it, and class after class of students have learned their world crop distributions from it. O. E. Baker went on with his classic "Graphic Summaries," pioneering the graphic interpretation of agricultural statistics. The Office of Foreign Agriculture Relations published an *Agricultural Geography of Europe and the Near East* in 1948 (Bacon, *et al.* U.S.D.A., O.F.A.R., Misc. Pub. #665). It was not until November 1954, however, that we had a successor to Baker and Finch's original atlas. Dr. Van Royen and his staff, stimulated by their association with O. E. Baker, set their sights on much more than a revision of the old atlas. Although the body of the new atlas still consists of dot maps of the distribution of concrete agricultural phenomena, there is much more besides. The atlas, organized by crops, emphasizes acreage and production maps using dots, density symbols and proportional circles or bars as they are appropriate. Detailed qualitative maps of the United States and other parts of the world where the crops are important accompany the general maps of world acreage and production. Bar charts showing absolute production or historical trend, pie charts showing percentage of production, flow charts showing marketing and processing channels all add to the significance of the presentations.

The chapter on wheat production, for example, includes the following:

Maps of:
- Origin of major wheat species
- Protein content of wheat
- World wheat acreage
- World wheat production (by countries)
- U. S. and Canada:
  - Wheat production
  - Wheat yield
  - Winter wheat acreage
  - Spring wheat acreage
  - Dates when wheat seeding begins
  - Dates when wheat harvesting begins

Graph of marketing channels—utilization of wheat, U. S.
Maps of:
U. S. bulk grain storage capacity
Europe and adjacent countries:
Winter wheat date when seeding begins
Winter wheat date when harvest begins
Wheat acreage
Wheat production
Winter wheat acreage
Spring wheat acreage
Area of cultivated land and percentage in wheat
Wheat consumption and percentage imported
China, Manchuria and Korea:
Wheat acreage
Wheat production
India and Pakistan:
Wheat acreage
Wheat production
Japan:
Wheat acreage
Argentina, Chile and Uraguay:
Wheat acreage
Australia:
Wheat acreage
Wheat production
Union of South Africa:
Wheat acreage.

In spite of this profusion of maps, all big enough to see, thirty percent of the space on the twenty-one pages devoted to wheat is text describing the causes for the distributions shown and the conditions under which wheat is grown.

The section on wheat, the first crop treated, is preceded by three introductory sections. In the introduction itself Dr. Van Royen describes some of the difficulties in preparing the atlas and gives credit to the fine cooperation between the University of Maryland and the Office of Foreign Agricultural Relations and the Bureau of Agricultural Economics of the U. S. Department of Agriculture. This text accompanies a series of maps on world relief, climate, soil and population.

The second introductory chapter, "Agricultural Regions and Land Use," is perhaps the weakest in the atlas. Although valuable "major land use" maps are presented for each continent, the text describes and analyzes only the United States. No justification or description is given of the World Agricultural Regions map and there is no discussion of the whole question of the classification of agricultural regions or types of agriculture. This only emphasizes that the volume is largely a statistical atlas.

In contrast, the third introductory chapter, "Identification Maps," is a great bonus. This chapter will help innumerable scholars avoid the frustration of finding themselves unable to match their statistical data with the state, province, county, district or minor civil division to which their data refers.

Following wheat are sections on each of the grains, starch and sugar crops, fruits, stimulants and vegetables. Then come the industrial crops: vegetable oils, tobacco, rubber, cotton, and fibers other than cotton. The final sections of the atlas are devoted to livestock and livestock production. The maps in these sections show first the distribution of major agricultural phenomena. These are followed by detailed maps of areas and maps of other relevant distributions. The chapter on cattle and dairying, for example, shows the distribution of cattle for the world and the cattle producing regions, including the distribution of water buffalo in Southern and Eastern Asia. In addition, for the United States there are maps of milk produced, milk sold, fat test of milk sold, evaporated whole milk, factory cheese production, factory butter production, farm butter production, cream sold as butter fat, and value of dairy products sold. There are also marketing channel graphs for fluid milk and butter and a graph showing per capita consumption of dairy products in the United States, 1929-1950.

The atlas will be used primarily for the distribution maps, but there is an almost equally valuable text accompanying the maps that includes discussion of the origin of agricultural species, the varieties and their distinguishing characteristics and uses, significant observations on world and regional production including a good deal of the ecology of the species. Factors influencing comparative advantage in the production of a particular commodity are pulled together to give the reader a reasonable understanding of reasons for the commodity being produced where it is. Significant aspects of marketing, processing and use are added. Often the temporal trend of acreage or production is included. The text material is certainly as much as one could expect to assign to students in a course in world agriculture. It would also satisfy the professional economist or geographer who wants a general view of the production and regional distribution of a commodity. For those interested in a more detailed knowledge, there is a list of the most pertinent references for the commodity or commodities involved at the end of each chapter. Finally, the last two pages are devoted to selected references, both for regional and world agricultural study.

We cannot help but feel a deep respect for the enormous statistical effort embodied in this atlas. We congratulate Dr. Van Royen for having brought the project to completion and for having included much valu-

able text along with the excellent statistical maps. This is an important work that might have been done constructively any time during the last two decades and has been well done now. We hope that the profession will not have to wait another thirty-five years for another revision.

In spite of this feeling of praise, we cannot fail to mention a few important omissions. One that will be missed by many are world trade flow diagrams. These have been used successfully by the Foreign Agricultural Service and have helped all of us to visualize this important aspect of agricultural economics. Dr. Van Royen justifies the omission of these trade flow diagrams on the basis of the abnormality of both the war and the postwar years. Since we sit on the sidelines, we cannot really question his judgment, but we do deplore their absence in the atlas. Perhaps the University of Maryland and the Foreign Agricultural Service can issue a booklet of world trade in agricultural commodities to supplement this major volume.

The other omission, perhaps, is the lack of maps showing the ratio of one land use or agricultural element to another. It could easily be asserted that these ratio maps are beyond the scope of such an atlas. They certainly would increase the statistical work necessary manyfold. The fact remains that while both the acreage in hay and the acreage in small grains are important agricultural facts for Western Europe, an equally important distributional fact is the ratio between small grains and hay. Except for a few yield maps (production per acre) ratio maps are absent from the atlas.

Second thought requires us to offer this last paragraph, not as a criticism of the atlas, but as a challenge to those of us interested in world agriculture; a challenge to discover, agree upon and map the important ratios of agricultural land use and production.

No library and no office concerned with world agriculture can afford to be without the *Atlas of Agricultural Resources of the World.* It will stand as the primary general reference on agricultural resources for at least a decade.

NICHOLAS HELBURN

Montana State College

Water: The Yearbook of Agriculture 1955, Alfred Stefferud (Ed.), Washington: The United States Department of Agriculture 1955. Pp. xiii, 751. $2.00.

The United States Department of Agriculture has published the 1955 yearbook on the important and timely subject of water. This yearbook, according to its editor, is to supply as much information as possible about water in a practical useful way for farmers and others who use water.

Water, the title of the yearbook, contains 95 sections on such varied phases of the subject as the hydrologic cycle, purifying salt water, rain making, increasing water yield through forest management, drainage, irrigation, wildlife management, flood prevention, watershed management, pollution, and industrial needs. Geologists, chemists, engineers, agronomists, agricultural economists and others—149 in all—have written down what is known about water in nontechnical language. This wide range of subject matter is rather loosely grouped under the following headings:

1. Our Need for Water
2. Where We Get Our Water
3. Water and Our Soil
4. Caring for Our Watersheds
5. Water and Our Forests
6. Water for Irrigation
7. Water and Our Crops
8. Our Ranges and Pastures
9. Gardens, Turfs and Orchards
10. Drainage of Fields
11. Water and Our Wildlife
12. Pure Water for Farm and Cities
13. A Look at the Future

The yearbook presents a large amount of basic information about water and its agricultural uses, particularly irrigation and drainage. A few sections deal with nonagricultural uses, notably pollution, city water supplies, industrial uses, and wildlife needs. A number of sections emphasize land management on the upstream watersheds as a means of flood prevention and the small watersheds program is the subject of one section. In general, however, the yearbook does not adequately point up the problems of conflicting land use (except perhaps the conflict between drainage and wildlife). Nor does it treat the rather substantial water development organizations such as TVA, Missouri Valley Interagency Committee, Interstate Compacts, etc. (Only one section of eight pages is devoted to "Planning a Large Irrigation Project.") Also there seems to be a general note of conservatism or understatement both with respect to technological change and with respect to the intensity of future water problems. Nevertheless, the yearbook measures up to the objectives of the editor and the yearbook committee. It is intended to be an informational publication rather than directed to problem solving.

Agricultural economists will, I think, find the information in "Water" extremely useful in understanding and in analyzing some of the important economic problems of the future. Water is rapidly becoming more scarce relative to its use and hence more valuable. In agriculture, the know-how of production is fast reaching a point where water is becoming the limiting factor even in the humid areas of the United States. A

Wisconsin farmer in 1954 produced without irrigation water an average of more than 160 bushels of corn to the acre on 40 acres. It is evident that to push production much beyond this point will require addition of water even in areas of 30 to 40-inch rainfall. At the time water is becoming the limiting factor in agricultural production, nonagricultural uses are also increasing rapidly. Increases in population and its shift to urban centers have brought critical problems of increasing domestic and municipal water supplies. Industry is expanding and the new industries take many times as much water as the old.

The rights to use water, partly because of the rapid increases in value, are undergoing major revisions. And these rights or the decisions as to who gets the water are not in any very large part determined in the market place.

The resolution of the increasing conflicts in water use will, I think, be one of the major problems confronting agricultural economists in the next 15 years. Should the farmer get the water to irrigate? Should the city have it for municipal supplies or the industries for new plant expansion? Or should it be developed for recreation and wildlife? And who will pay how much for what type of water development? Water problems will force us to look at the broad range of conflicting uses, not just agricultural use. It will force us to analyze and understand institutions and economic organization as a part of our problems. And we as agricultural economists may profit by such emphasis.

The U.S.D.A. should be commended for adding another to its already long list of outstanding yearbooks. No other organization or type of publication could fill this need. The 1955 yearbook should erase any doubts as to the wisdom of the yearbook. This publication justifies the efforts in the last few years to continue the series. We, as agricultural economists, and particularly Prof. Charles Stewart of Illinois, have been well rewarded for our strong support of the U.S.D.A. yearbook.

RAYMOND J. PENN

University of Wisconsin

A Statistical Study of Livestock Production and Marketing. Clifford Hildreth and F. G. Jarrett, Cowles Commission for Research in Economics Monograph No. 15, New York: John Wiley and Sons, Inc., 1955. Pp. xiii, 156. $4.50.

This is a significant contribution to an understanding of the simultaneous equations approach in economics. A particular sector of the United States economy—the livestock and feed industry— is studied by means of an eight-equation model of the "shock" type. Throughout the work "livestock and livestock products" are treated as a single aggregate.

Feeds for the most part are classified into three main groups, roughage, feed grains, and protein feeds.

Considerable theoretical discussion is given in support of the various postulated relations. Five of the eight relations are given a complete specification and are fitted to annual data for the period 1920-1949. Coefficients are estimated by the limited information method and also by the single equation least squares method. The numerical results, which are not entirely satisfactory to the authors, are discussed extensively and are also subjected to several statistical tests, including a prediction test for the year 1950.

The book is well written with the needs of the practicing economist in view. Although it is not easy reading, it is easier to read than any of the last five Cowles Commission monographs. Some readers who desire to attain a fairly complete mastery of the simultaneous equation approach will need some previous initiation through studying such works as Cowles Commission Monograph 14 or Klein's *Textbook of Econometrics*. For example, some background is presumed on the Rubin-Anderson test, which the authors apply as a routine. But they provide only a rather brief introduction and somewhat obscure interpretation.

Outstanding, in this reviewer's opinion, is the exposition in Chapter II, where a complex model is developed in stages by starting with a rather simple model and by adding various complicating factors. The basic data used in the research and the methods of constructing the various indexes are described in complete detail in Chapter III.

Although the authors state that their main objective is methodological, they did obtain some valid empirical findings. Their strongest results, judging by *a priori* plausibility, statistical significance, and consistency with previous studies, are found in their demand relations for livestock products and for feed grains. The least satisfactory of the estimated relations are those of the production function for livestock and of the supply of livestock. In regard to the production function for livestock the authors state that none of the equations studied appears to give a satisfactory empirical representation (p. 76). Most readers will concur. In the supply of livestock relation, out of six variables postulated to have significant effects three are statistically nonsignificant, and it is at least arguable that a fourth does not have a coefficient with the wrong sign, namely the negative coefficient representing the effect of current price of livestock products on quantity of livestock sold (p. 105).

Some of these difficulties stem from the degree of aggregation attempted. The more that the parameters of individual products of an aggregate—cattle, hogs, poultry, dairy products—differ among themselves, the more difficult it is to postulate plausible parameters for the aggregate

a priori. A similar remark applies to structural change of parameters over time. The authors recognize all this and give some counter arguments in support of their aggregates, chiefly the high degree of substitutability among individual products and computational economy. On balance it seems difficult to criticize the way this problem has been handled. Some readers will criticize on grounds that the authors' aggregative results are not useful for most practical prediction problems; but this is not obviously true (we all use averages to some extent). In any case the point is not relevant to the authors' basic methodological objectives.

Econometricians face an important question concerning the extent and the situations in which simultaneous equations estimating techniques are practically necessary in lieu of single equation techniques. Single equation techniques include application of least squares to recursive models. In what situations do certain estimated coefficients in a simultaneous model become so near to zero that for practical purposes the model is equivalent to either a recursive model or to a set of equations each of which contains only one endogenous variable? Recently Fox and Foote (USDA Technical Bulletin 1081 and Agriculture Handbook 64) have argued cogently, with numerical examples, that such situations are frequent in models representing supply and demand for agricultural products. The point is important because of the substantially higher cost of applying the simultaneous techniques.

In the book under review this problem is recognized by the calculation of least squares estimates to compare with the limited information estimates from the eight-equation model. The two sets of calculated estimates are, in fact, quite close. For every coefficient presented in Chapter IV the difference between the two estimating procedures is statistically insignificant at the 5 percent level. The authors do not, however, draw any conclusions regarding the practical necessity of their simultaneous model, either from these results or from other considerations. This is regrettable, since they must certainly be aware of the issue and the current interest in it. Their opinion would be valuable. This reviewer submits the conjecture that the empirical data in this volume could be fitted to a recursive model with satisfactory results—probably to the "crude" model of four equations first suggested by the authors (p. 11).

A related question, not posed in this book and beyond the scope of this review, concerns how these situations can be recognized prior to carrying out all of the computations.

Only those who have subjected themselves to the discipline of trying to secure valid quantitative estimates of complex phenomena will understand the magnitude of the authors' efforts. Their contribution, using the highest research standards, is a thorough analysis of a specific example

of economic reality. Undoubtedly their work will be of great aid to others dealing with similar problems.

WALTER D. FISHER

Kansas State College

The Agricultural Economy of the Danubian Countries, 1935-45, S. D. Zagoroff, Jeno Vegh, and Alexander D. Bilimovich, Stanford: Stanford University Press, 1955. Pp. xiv, 478. $7.50.

This book is the eighth in a series being published by the Food Research Institute of Stanford University on the general theme of Food, Agriculture, and World War II. The title of this volume is somewhat misleading in that the study does not cover completely the economic elements of Danubian agriculture. For instance, the first part of the book treats Danubian Europe (Hungary, Yugoslavia, Rumania, and Bulgaria) as a whole, describing its physical conditions, the position of agriculture in the national economies, agrarian reforms, and the food balance of the region. The original part of the analysis is that dealing with the situation during World War II which was characterized by a general decline of the per head figures of food supply in all four countries.

The book was edited by and this opening section was written by Dr. S. D. Zagoroff, formerly Director General of the Central Statistical Bureau, who assisted the reviewer in the selection of a Bulgarian village for study during the 1930's.[1] One cannot help being impressed by the competent way in which Dr. Zagoroff has made use of the available data, scanty though they be at times. His calculations of the net product of agriculture (relying for the Rumanian figures upon the *Farm Accountancy Statistics* of the former International Institute of Agriculture) and his calculation of the effective food-energy supply (in terms of EMM and ENA) are particularly interesting. A further complication in this analysis was the shifting political boundaries before, during, and after World War II.

The second section, which deals with Hungary, was prepared by Jeno Vegh, a Hungarian economist and former Secretary-General of the National Association of Manufacturers of Hungary. Mr. Vegh relies almost entirely upon a Hungarian source entitled *Our Production and Supply of Food*, published in 1943.[2] He concludes that the wartime decline in

[1] Irwin T. Sanders, *Balkan Village*, Lexington: University of Kentucky, 1949.

[2] This was not available in Washington during 1943 and 1944 when the reviewer helped prepare civil affairs handbooks dealing with the agriculture of these Danubian countries, including Hungary. Anyone interested in the agriculture of Eastern Europe should consult the two handbooks on Hungary and Bulgaria which have been declassified and are catalogued in most libraries as Army Service Forces Manual M369-7 and M358-7. As one would expect, there are some discrepancies between the work done in Budapest and that done in Washington.

total food supplies in Hungary was not very substantial. Until the beginning of 1943 the rural people fared about as well as they did before the war. Transportation difficulties restricted the supply available to city people.

Dr. Zagoroff prepared the third section on Rumania with the help of a Rumanian expert who prefers to remain unnamed for fear of reprisals on members of his family still in Rumania. Because of the lack of adequate statistics this section is the briefest (60 pages) and the least analytical. Rationing was practiced during the war but most of the time people could get food items without using their ration cards. The chief official concern by 1944 was not distribution but the control of prices of food.

The fourth section on Yugoslavia by Dr. Alexander D. Bilimovich, a former professor of economics at the Universities of Kiev (Russia) and Ljubljana (Yugoslavia), faces statistical difficulties in estimating production and food supply during the war years and immediately after the war. The author has a tendency to rely on the UNRRA studies, although he admits that they are subject to serious reservations.[3] Nevertheless, Dr. Bilimovich clearly reveals the tremendous part played by UNRRA in overcoming the food deficiences resulting from the long years of destruction and attrition from which the Danubian countries were largely spared.

In Bulgaria, discussed in the last part of this book, the situation was different from Yugoslavia.[4] Because of firm data and the fact that Bulgaria had advanced more in the field of agricultural economics than any of the other Danubian countries Dr. Zagoroff, who did this section, was able to prepare a convincing and comprehensive picture. He points out that, contrary to what is usually thought, the *real income* of the farm population in Bulgaria during the years 1935-39 increased in spite of the rise in price of the commodities bought by the farmers.

The Agricultural Economy of the Danubian Countries, 1935-45 is a veritable gold mine of information; but one has to dig to get the pay ore. Useful information is found in 170 numbered tables throughout the book and in many other unnumbered tabular presentations. Methodological notes on statistical methods employed are clear and helpful. A

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[3] The reviewer can substantiate this point of view since he served as Agricultural Attaché in the American Embassy in Belgrade in 1945-46 and noted that the UNRRA staff, under a Russian chief of mission, had to accept the official figures. The poor state of communication within the country, the political tension, and the disorganization of the statistical services led to obvious errors in the official releases.

[4] In late 1945, the reviewer found not just one but three carefully-calculated agricultural statistical series and the problem was one of determining which more clearly described the situation rather than one of trying to make guesses or estimates as was necessary for Rumania and for much of Yugoslavia.

comprehensive covering of pertinent literature in all of the languages is evident. One wonders why more use has not been made of the statistical series prepared and kept up to date by the Foreign Agricultural Services of the U. S. Department of Agriculture. After all, American agricultural attachés are employed at considerable expense to report on crop and livestock situations and to send in corrected estimates. To the extent that these series are merely duplication of official statistics, then it would be wiser to go to the original sources as has been done in some of the sections of this book. It often happens, however, that corrections are made in the official figures in the light of information known to those responsible for the USDA series. Studies of this sort should at least consider and then use, modify, or reject the USDA series, since these form the bases of much American economic policy.

IRWIN T. SANDERS

University of Kentucky

Regulations Affecting the Movement and Merchandising of Milk, Marketing Research Report No. 98, U.S.D.A., A.M.S. June 1955

This report is the result of an extensive study of regulations affecting the movement and merchandising of milk. Impetus for doing this study seems to have grown out of the increasingly large holdings of dairy products by the government for price support purposes and the interest in expansion of consumption as a countermeasure.

The authors should be congratulated on providing a very complete and comprehensive report on regulations affecting milk movements, covering conditions from coast to coast. The report is well written and is at a level particularly meaningful to all segments of the dairy industry. The authors also exhibited a thorough, intimate knowledge of the dairy industry.

The report is recommended to students in the field of dairy marketing. A careful reading within the industry would be of much value to plant management, cooperative management, directors and advisory councilmen, state and federal regulatory officials.

Principal categories are the following: (1) sanitary regulations, (2) federal orders, (3) state orders, (4) transportation encumbrances, (5) an analysis of price structure, and (6) difficulties in the way of removing restrictions.

In tackling the problems of sanitary regulations, the authors faced the most difficult task of trying to determine when sanitary regulations are restrictive. Enforcement is probably of equal or greater importance than the regulations themselves. Four points seem worthy of mention: (1) All major fluid milk markets demand "safe" milk. Regulations are

required to obtain such milk. (2) Most health departments have a shortage of personnel and funds and therefore must work within a budget. (3) Health department officials concern themselves with assuring an adequate supply over the long run. (4) Health departments give different interpretations to regulations.

The execution of health regulations for a milk supply will have some economic effects and there are reasons for and against each regulation. The increasing amount of milk being sold in markets other than the one in which it was processed is evidence of increasingly fewer restrictive regulations. The sections of this report dealing with federal and state marketing orders also present both sides of those provisions that the authors consider restrictive. Here the principal problem seemed to be what constitutes "stability" in a market and *how* is it obtained.

The authors deemed state controls to be more restrictive than federal controls. Most state milk control agencies would do well to read carefully the sections of this report dealing with state controls and to weigh the authors' analysis of the effects of regulations limiting the opportunities for introduction of innovations in marketing practices.

Federal orders were not deemed to be restrictive in most cases, although in certain respects they could become restrictive. As was pointed out in the report, federal orders need to price *all* milk in a fluid market so that raw material costs to handlers are the same for each product. The method and procedure for dividing the total value of pooled receipts among individual producers also presented restrictive aspects. Two general areas of restrictive influences were pointed out: (1) restrictions on individual handlers who may desire to come into the pool for a variety of reasons, and (2) restrictions on individual producers (e.g. base surplus plans).

The report indicates that it is most difficult to compare markets because of differences in the basic order definitions (e.g., definitions of producers and handlers are different, pool plant qualifications are different, classifications are different, to name only a few). Perhaps a greater degree of uniformity among federal orders is required. This does not mean uniformity of prices, but rather a uniformity of method.

The weakest section of this report deals with the effect of restrictions or lack of them upon consumption; but a thorough analysis of this would necessitate another research job. Although some work has been done on price elasticity of demand for milk and is referred to in the report, this is inadequate to measure effects on consumption over time and the effects of various practices upon consumption deserve more study. A wide range in retail prices is evident among the principal markets of the country. This also affects per capita consumption.

The report presents an excellent analysis of a very complicated problem that has implications in the fields of public health, economics, business organization, and politics. It should serve as a useful guide and a source of information to all segments of the milk industry.

ELMER F. BAUMER

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Political Prairie Fire—The Nonpartisan League, 1915-1922, Robert L. Morlan, Minneapolis: University of Minnesota Press, 1955. Pp. 408. $5.75.

This history of the Nonpartisan League describes one relatively short period in an agrarian revolt whose roots reach much further back than 1915, and whose activities have been greatly modified since 1922 by influences both within and without the League.

A. C. Townley's efforts in building and directing the League are dramatically told with frequent picturesque quotations from Mr. Townley. The quiet fundamental roles of Dr. E. F. Ladd and President J. H. Worst of the North Dakota Agricultural College are pointed out rather more clearly than by any other writer.

Careful readers of the book who may have hitherto been under the illusion that the Nonpartisan League movement was primarily confined to North Dakota will discover that the movement was organized in thirteen states. Although it was concentrated in North Dakota and Minnesota the League leaders clearly envisioned a national party.

The author devotes much space to portraying the bitterness of the opposition to the League on the part of the American press and conservative elements in the established political parties.

To this strictly nonpolitical observer of the North Dakota scene, the author's concluding paragraph appears to be a fair statement of fact. It states the case as follows:

> "Opinion in North Dakota is sharply divided as to the value of the state mill and elevator to the state, but there is general agreement on the part of both friends and foes of the League that the other enterprises and reforms that it instituted have served North Dakota well. Only the Home Building Association no longer exists. Although the Nonpartisan League underwent many changes after 1921, its basic philosophy has been altered surprisingly little. Still looked upon as the furthest to the left of any major element in North Dakota politics, its views no longer give rise to charges of anarchy and bolshevism. The bitter antagonism of forty years ago is gone. The radicalism of 1916 is in large measure the accepted practice of today."

Author Morlan has made a conscientious effort to treat both pro-League and anti-League forces fairly, although the general character of his discussion is favorable to the League. An elaborate set of footnotes, placed at the end of the book, carefully documents each chapter.

An extensive bibliography of books, government publications, pamphlets issued by the Nonpartisan League and pamphlets issued in opposition to the League, articles in American magazines, theses and unpublished writings, and collections of papers and manuscripts have provided a broad base for his portrayal of "a political prairie fire." This bibliography will be widely used by all future students of agrarian movements.

H. L. WALSTER

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A Study of Saving in the United States, Volumes I and II, Raymond W. Goldsmith, Published for the National Bureau of Economic Research by the Princeton University Press, Princeton, New Jersey, 1955. Pp. xxx, 1138 and xxiv, 632. $30.00 (both volumes).

These two volumes describe the factual material and methodology employed in this presentation of certain features of saving in the United States during the period 1897-1949. Another forthcoming volume will present four related studies of the national balance sheet, wealth, and saving estimates as derived from household expenditure surveys, and estate tax returns—sources of data that were not employed in the two volumes reviewed here.

That saving is a topic meriting extensive study cannot be denied. More accurate forecasts of saving would aid in policies designed to achieve greater economic stability through fiscal and monetary arrangements. Between the inception of the Keynesian theory of the equilibrium level of income and the end of World War II, it was generally believed that the relationship between saving and disposable income was a fairly stable one and that investment was the variable containing a substantial disturbance. However, during the past decade economists have come to realize that they knew less about saving than they thought was the case. In particular, variables in addition to income appear to be important in determining how much saving takes place. A model relating saving to disposable income yields substantial errors of prediction. If the more important of these other variables can be identified, their weights measured and dependable information about their future values obtained, our confidence in discretionary fiscal or monetary changes to reduce income fluctuations would be increased.

Since World War II interest in the classical economic problems of economic growth has increased. In many countries the rate of growth is primarily dependent upon the rate of saving. Additional knowledge of what determines saving would aid in estimating the rates of economic growth and in the formulation of policies to increase these rates.

One way of obtaining knowledge about saving relationships is through

the analysis of historical observations—time series. Such observations have been summarized and classified, and some of the relationships among classes have been analyzed in this study.

If monumentality is correlated with bulk, this study must be considered monumental. The first two volumes—excluding the index—comprise nearly 1800 pages of literary and tabular presentation. Most of the data have not been generally available before and will provide other research workers with opportunities to test hypotheses that previously could not be tested with readily available data. The value assigned to the analysis depends upon the reader's judgment of what is important as well as whether the inferences regarding the relationship between the observed facts and particular theories are legitimate.

The study presents annual estimates of saving and income for the entire period 1897-1949. It estimates the amount of saving by selected classes of economic units—government (federal, state, and local), corporations, unincorporated business (excluding farmers), corporations, farmers, and nonfarm individuals. It estimates the form that the saving took—nonfarm real estate, farm real estate, durables (consumer and producer), inventories and others. And, it estimates the relationship between income and saving with the National Bureau of Economic Research's business cycle "reference points" being introduced as attributes affecting the income-saving ratio. There are also estimates of cash holdings of various classes of economic units (quantities that need not be related to values of the primary variable, saving), assets of various financial institutions, and a host of other estimates of asset compositions. Savings may be estimated from estimated changes in the value of assets between two points in time. However, the relationship between the asset categories chosen for detailed description and saving is not made clear.

Two main questions relating to the study are: (1) How accurate are the data? (2) How useful are the data presented? The first question is not to be answered by this reviewer. The answer to the second depends upon what kinds of questions one wishes to answer.

No standard errors of estimate could be attached to the various estimates presented in these volumes. The authors compare many of their estimates with those of other research workers, revealing agreement in many cases and substantial discrepancies in some cases. However, the cost of error depends upon the way in which the data are to be used, and the outcomes of using one estimate rather than another may be essentially the same for many purposes.

The usefulness of data depends upon the classes of theories one wishes to test. Frequently a theory may not be testable because data are not available. One might easily conclude that Goldsmith and his associates

have assembled almost everything available that might be of interest to persons trying to describe and explain saving. That observations of some important variables have not been included is not the fault of the authors. Such observations probably are not available. That observations of some variables that the reviewer considers unimportant have been included is the consequence of differences in judgments regarding what is important.

Insofar as a theory of saving is proposed, it is inadequate by the standards of this reviewer as well as by the standards of the authors. The relationships estimated are primarily those between saving and income, different relationships being ascribed to different time periods. The time periods were chosen largely with reference to the National Bureau of Economic Research classification of business cycle reference points. Such reference points may be interesting for classification purposes, but are of little use for predictive purposes since one cannot in advance recognize which reference point characterizes current conditions.

This study will be of interest to agricultural economists in that farmers are classified separately from other groups in the population in much of the description. Data on farm saving, farm income, farm real estate and farm credit are separable from data on other national aggregates throughout most of the period. Persons whose policy proposals hinge upon the belief that there are differences between farm and nonfarm behavior with respect to spending and saving will find these volumes useful sources of information.

In summary, these volumes present a detailed historical account of saving and income during the first half of the current century. They classify saving according to types of saving and kinds of savers, disaggregating as much as is feasible given the available data. One cannot estimate the accuracy of the information presented. The authors compare their estimates with those of other research workers. In most cases the differences are negligible, since the various workers frequently relied upon the same primary sources. One is not able to evaluate the importance of the differences, since the consequences of employing one estimate rather than another are not investigated. This reviewer would consider some of the data to be irrelevant to the problem being investigated. And he would consider the analysis to be inadequate, insofar as it is concerned with predicting the amount and composition of saving. However, other research workers now have a mine of accessible information which otherwise would not have been available.

It is difficult in a short review, to convey the care that those responsible for this study exercised in choosing one concept rather than another from among the various possible definitions of saving and income that

have been employed. Those responsible also are thoroughly aware of the problems involved in aggregation, particularly with reference to obtaining estimates of real values from observations of money values.

To persons interested in obtaining a cursory picture of saving, these volumes—except for the summary—will be of secondry importance. For those interested in using the most detailed source of information to test their (or other persons') theories, these volumes will merit careful examination.

O. H. BROWNLEE

University of Minnesota

Natural Resources: The Economics of Conservation, Anthony Scott, Toronto: The University of Toronto Press, 1955. Pp. ix, 184. $3.25.

The general premise of the study is that the body of germane economic theory is such as to permit economists to contribute more effectively than they have to the clarification of resource conservation issues. The more significant economic implications of conservation are explored and the economic rationale considered appropriate is indicated.

Part one of the text consists of three chapters devoted to conservation theory and practice. The nature of the approach to be applied throughout much of the study becomes apparent in the first chapter on the "Theory of Use." With some qualifications, the author concludes that since natural resources are an interrelated part of social capital, resource exploitation provides new and efficient forms of such capital and hence is likely to increase (rather than reduce) the well-being of posterity. The significance of distinctions between various types of resources and forms of capital that have been emphasized in the literature are rejected as a basis for justifying differential social concern over natural resources. These include those based on origin, continuous use and replacement possibilities. Anticipations of entrepreneurs are considered sufficient to bring about a balance in resource investments that is consistent with the social interest. Conservation is broadly defined as "a public policy which seeks to increase future usable supplies of a natural resource by present actions." The concept is intended to imply physical rather than monetary measure and is limited by definition to changes in rates of use resulting from government programs or policies. The extent to which conservation has been practiced in the sense defined is then sketched for the major countries in Western Europe and North America and the principal motivating forces are indicated.

The second group of chapters consider the validity of the various reasons that have been used to justify public intervention, such as social benefits, ignorance, risk and monopoly, and a social interest rate. Recog-

nition is given to the possibilities of private revenues and costs departing from social benefits and costs and the need for resolving conflicts by public participation. The extent of the discrepancies that occur in the natural resource field depend upon the "specificity" of the resource. Resources are considered "specific" if all costs of production are borne by the producing enterprise. Resources are classed as "non-specific" if producers bear only a portion of the costs and the possibility of private and social conflicts of interest are accordingly increased. The existence of producers' ignorance is considered the only other reason warranting public intervention. Thus, aside from ignorance and extra market benefits and costs, the operation of the "hidden hand" is already making the most effective provision for posterity.

The third and final group of chapters discuss measures that may be applied if the state decides to interfere. The principal measures covered include socialization, regulation and informational guidance, modifications in resource tenure, and taxation. The practical need is that of finding and adopting measures that will induce private owners to practice conservation. This may often require tenure changes designed to improve ownership rights, combined with taxes, preferably of the income type.

Mr. Scott's extensive coverage of the literature is reflected in the many references cited in the study. A great deal of material is presented in rather limited space. Perhaps the treatment is often too condensed to do justice to the many complex and controversial issues treated. In particular, the sources of divergence between private and social values appear to warrant more thorough consideration than is given. For example, more attention might have been given to differences stemming from real costs and benefits measured in terms of purchasing power rather than in dollar prices, to imperfections in the market stemming from government programs and administered prices, and to departures in market interest rates from the productivity of capital. Also variations stemming from differences between costs and transfer payments, such as arise in the case of taxes, merit further analysis. The value of incremental segments of resources, as measured by the area under the demand curve, should be distinguished from values based on marginal units of product.

Perhaps the principal contribution of the book is in indicating the need for sharpening and clarifying the economic rationale applicable to the analysis of conservation activities, and in provoking interest in the development of more precise and appropriate economic criteria for the social evaluation of conservation.

MARK M. REGAN

Agricultural Research Service, USDA

American Economic Development, Herman E. Krooss, New York: Prentice-Hall, Inc., 1955. Pp. xvi, 536. $8.00.

Professor Krooss uses what he calls a topical rather than a chronological approach to describe and explain the economic development of the United States from colonial times down to the present. He employs economic history as a subdivision of general history and defines economic history as "the branch of learning that deals with the ways in which man has used his limited resources to satisfy his material wants and with the institutions he has developed to organize his economic activities." To achieve integration of his topics and to establish a measuring rod for economic development, long-run effects on the level of living are emphasized. Most important determinants are the natural resource endowment, capital accumulation, efficient labor, entrepreneurial imagination and a value system that places emphasis on economic success.

The book contains sixteen chapters. Aside from chapter one, which lays out and justifies the methodology, the author examines levels of living as related to national income and business cycles, patterns of consumer expenditure, land and population. He considers contributions of the farmer, labor and trade unionism, capital accumulation and business enterprise, foreign and domestic commerce, and the parts played by government and war. Chapter sixteen provides a postscript and discussion of expectations for the future. The factors behind American economic growth are the physical environment, old world contributions, individualism and the drive for economic success, a high propensity to consume, a philosophy of optimism and government activity. Among expectations for the future are an even more rapid substitution of capital for labor, higher levels of living, closer observation of problems pertaining to high levels of consumption and avoidance of economic depressions, ways to fill the increasing amount of leisure time, and increasing attention to the overshadowing problem of maintaining peace in the world. If a hero exists, it might require splitting the thin and sometimes nonexistent line between the entrepreneur and the financier.

Professor Krooss has done a commendable service by pulling together informative and valuable statistical data. He indicates the direction of important long-run trends, and documents interesting historical events of economic significance. However, although actual changes are noted, the value of the analysis is questionable.

First, the reviewer would question several generalizations. The author notes "The climate (of the Great Plains) is not conducive to best physical and mental effort." On the evolution of trade unionism he states "But even labor itself was apathetic toward early unions . . . the laborer, especially the skilled laborer, . . . looked forward with confident optimism to the day when he would be a landowner, a small businessman . . ."

(p. 195). It might be true that plentiful natural resources endowed the laborer with a psychology of abundance similar to that of the businessman. But his most valuable assets were his skill and his job. Although he had not perfected his instrument (union) to register dissatisfaction during early America, there was always a tendency to act whenever competitive menaces threatened his bargaining position.

In the chapter on agriculture there are several points of confusion. Using the number of farms as an indicator of agricultural growth and comparison raises many questions. Changes have occurred in census definitions of what constitutes a farm. The author seems to think that a tenant is not an entrepreneur. In relation to farm-to-urban migration, he says that "Even as late as 1940, farmers were the most restless Americans, as attested by the fact that the occupancy of the average farm was less than 12 years" (p. 120). In agricultural economics this measure is used to denote insecurity of tenure, which is not the same problem as migrating to cities. The growth in scale of farms does not necessarily suggest a need for a greater division of labor or specialization.

Several additional comments may be made. The author (or the publisher) should have indicated the use to be made of the book. Is it intended as a general reference book, a text, or a supplement to college courses in economics? Or is it best suited for high school use? The author only mentions the "general reader" (p. 5).

The treatment of some 239 different topics might prove to be confusing and repetitious. Within a chapter one topic is sometimes taken from colonial to modern times. Then a following topic is handled the same way. In the chapter on agriculture, for example, the author covers chronologically within each topic the declining importance of agriculture, farm organization, improvement in techniques, improvement in crops, improvement in livestock, history of machinery, yields, farmers' share of national income, production and prices, mechanization and scale of production, sources of capital, marketing problems, and farm policy. Such an encyclopedia of topics might tend to obscure general economic development and prevent portraying a vivid picture of the American economy at any one period.

The idea that the effects of change on real per capita income will serve as a unifying device does not seem to provide the necessary clarity. Moreover the components of real per capita income are themselves interwoven into the fabric of economic development. In 1955 the level of real income depends on social security benefits as well as on the opportunity to engage in production.

The author's intention stated in the preface, to stress the economist's methodology and to place more than the usual emphasis on economic theory, has not been demonstrated unless the comparison is with gen-

eral history books. The author makes references to assumptions and ideas in price theory that are generally accepted and to a few implications found in fiscal and monetary economics. But if the product is compared with books like those of Smith, Marx, Keynes and Schumpeter, which are in varying degrees landmarks in economic development, only a restricted amount of theory is utilized.

Finally, in the opinion of the reviewer, the author sticks too closely to a limited definition of economics "as subject matter dealing with the way in which man uses his limited resources to satisfy his material wants" (p. 1) and places too much reliance on specific insights taken from the theory of the firm to supply all variables necessary to analyze the general or even specific processes of development. He notes that "Social welfare succeeds best in societies that emphasize production and business vitality, for welfare is a function of an expanding economy, not a social, economic or political ideology" (p. 521). But fruits of production are not automatically used for the general welfare or distributed to general satisfaction. It would appear that devices to maintain social order and security and to protect the stake of producers in economic development are necessary for efficiency and growth.

Despite these limitations Professor Krooss has presented us with a valuable contribution of information and data on the American economy and should be understandably proud of his work.

VERNON C. JOHNSON

Agricultural and Technical College of North Carolina

Economic History of the United States, Howard R. Smith, New York, Ronald Press, 1955. Pp. vii, 763. $6.00.

Occasionally historians and farm economists have bemoaned the lack of a suitable text in the history of American agriculture, and as a result have been forced to rely on the general texts in economic history for the information they want. Since this volume is designed as a general text it may appear unfair to appraise it strictly in terms of its agricultural contents. But the temptation to do so is irresistible; and perhaps on second thought it may not be as unreasonable as it first appears. Chronologically speaking, a very substantial, if not the greater part, of the economic history of this nation has been that of an agricultural society.

Howard R. Smith, a professional economist with an interest in history, is but one of several historians and economists who since 1945 have been trying their hand at writing texts in economic history. The publishers assure prospective readers and users that here at long last is the volume they have been looking for. They refer to it as an "unusually teachable

text" because it is based on a chronological-narrative approach and possesses certain other features that are rather unclear to the reviewer. Books have to be marketed just as wheat and cotton; and the publishers quite properly operate on the assumption that if one does not have faith in the quality of his product, no one else will. Unfortunately, the reviewer does not share their enthusiasm.

In several respects the volume reminds one of the ordinary text in United States history, especially the first few hundred pages. The chronological allotment of space is somewhat uneven. Roughly, about 430 pages are devoted to the period down to 1900 and about 300 pages to the years since the turn of the century. To some this may not appear as uneven an allocation as is claimed, but the elementary character of much of the material prior to 1900 convinces the reviewer, at least, that it is. The economic phases of the colonial, revolutionary, early national, and pre-Civil-War years receive scantier treatment than they do in some of the better texts in United States history. Once the author gets into the post-Civil-War era he displays a little more familiarity with his subject matter. Perhaps he is most at home in the twentieth century, especially in the years since 1940.

Farm economists will be disappointed with the superficial treatment given to the agricultural development of the nation; in fact they will find greener pastures in Carmen and Syrett's two-volume *History of the American People,* Shannon's *America's Economic Growth,* and Wright's *Economic History of the United States.* There is much merit to the author's dislike of the topical approach as it has been handled by earlier writers, but he goes to the opposite extreme. His overemphasis of the chronological is intemperate and strips the volume of what analytical usefulness it might have had. Students anxious to obtain a general background of the New Deal farm program will be exposed to a curious blend of preaching, superficial generalizations, evasiveness, and in some instances pronounced biases.

What Smith writes is readable and the format of the book is attractive; but so little of what it contains is new and large portions of it are so elementary that agriculturalists will do better by going elsewhere.

Theodore Saloutos

University of California at Los Angeles

The TVA, Gordon R. Clapp, Chicago, Illinois: The University of Chicago Press, 1955. Pp. xiii, 206. $3.50.

The TVA by former Board Chairman, Gordon R. Clapp, is an addition to the polemic that has centered around the Tennessee Valley Authority since its inception. In this book, a master advocate sums up his 21 years

of leadership within the Authority by clearly placing in public view the TVA ideal and some of the agency's practices.

In the foreword, Clapp, the administrative leader, illustrates the quality that pulls a staff together to achieve the performance he lauds. For the first 20 years, TVA had a succession of leaders that created a staff spirit of enterprise based upon merit, efficiency, and accountability as discussed in Chapter II. True, the TVA Act, the text, and the interpretation (Chapter I) gave such leadership the opportunity to function.

The ability to act and the philosophy behind the action are illustrated in Chapters III and IV. Chapter III cites examples or case stories of the developing economy of the Valley with strees upon the "chain reaction" effect of economic development. TVA's role is pictured as the catalyst that assisted the reacting process through its varied educational and research activities as well as in its operating role of providing flood protection, a navigable channel, and a supply of power. Chapter IV deals with TVA's state relationships, which belied for 20 years the frequently imputed "super state" concept. In carrying out its lines of direct responsibility, TVA has cooperated with local agencies, REA cooperatives, municipal power boards, state and local planning and zoning commissions, and state and local health offices, among others. In activities such as forestry and agriculture, TVA's policy has been to stimulate action and then withdraw with state, local, or private organizations carrying on the development.

Although the heart and soul of the TVA ideal are to be found in the foreword and the first four chapters, the muscle and brawn are in Chapters V, VI, and Appendix A. The inadequate expansion of United States electric generating capacity to meet the requirements of an expanding economy and of national defense is the central issue in Chapter V. This consistent underestimate of the demand for electricity by leaders of the private utilities is cited as a reason for continuing the policy of encouraging the growth of both private and public power (Chapter VI). He asserts the crucial problem in the electric utility industry is the maintenance of an imaginative and efficient management and not the problem of ownership. The 20 per cent of our national electric energy supplied under public management provides an element of "competitive enterprise" in a field of "monopolistic enterprises." As a result, better service from the public utilities, both "public" and "private," is claimed.

Agriculturalists will be interested in Appendix A, which sketches an outline of TVA's national fertilizer responsibility and policy. As a result of TVA's research and development activities, thousands of farmers use improved phosphate and nitrate fertilizer materials.

Students of resource development will do well to appraise Clapp's book as a part of the TVA argument and not to expect a precise analysis uncolored by the enthusiasm that has given TVA its vigor. The opponents of public power will be critical of his conclusion that we maintain and build public generating capacity, and they may be surprised at the suggestion that the private electric utilities need public assistance beyond the tax amortization privileges.

The economic analyst will want greater detail of presentation and may argue with some of the underlying assumptions in an attempt to fit the broad statements into a detailed analysis. For example, care wants to be exercised in claiming national benefits for the agency from secondary development. It is not always clear what portion or how much of the development process is claimed as an agency contribution.

The specialist in public administration may want to set out the functions delineated in the TVA Act to see how they have been carried out, and he will ponder the universality of the "Douglas Dam" decision as a principle. In making this decision, the TVA Board had the request of the Office of Production Management to deliver a specified quantity of electricity to a specific location within a limited period of time. The engineering staff said these requirements could be met only at the Douglas site, and the TVA Board withstood strong political pressure in defending this engineering recommendation. But, was not this decision somewhat unique considering the limitations of time, place, and quantity of power as imposed by another agency? On many questions, agencies cannot eschew the political and economic problems from administrative decisions. These questions certainly do not imply that an agency should become pressure directed and undercut its standards of merit and efficiency. However, many administrative decisions involve serious political and economic consequences, and many of the questions relating to these decisions must be answered at the administrative level.

The utility economist will want to know more about the basis for rate making and about the future demand for electricity. Mr. Clapp's book will not answer all such queries, for it is gauged to stimulate the general reader to think about the issues raised and to present a positive public power argument to the country.

For the person who is not acquainted with the Tennessee Valley Authority, this book will be a good place to start inquiring into the TVA point of view. For students of resource development who are already familiar with TVA, the book will provide a case example of positive administrative leadership. As economists move more deeply into the important problems of organizing an economy for development, they will

be confronted with many of the problems dealt with explicitly or by example. However, they may want to delve more deeply on some issues.

STEPHEN C. SMITH

University of California
Berkeley, California

The Pricing of Cigarette Tobaccos, Elmo L. Jackson, Gainsville: University of Florida Press, 1955. Pp. xiii, 239. $3.75 paper; $4.75 cloth.

This book by Elmo Jackson is the third major study of the tobacco industry during the last six years.[1] Each of the studies draws heavily on the record of the Tobacco Case of 1940-46.

The scope of Jackson's work is more limited than the other two major studies in that he concerns himself "solely with an attempt to find out the ways in which concentration of purchase has affected the pricing of the two largest classes of cigarette tobacco, flue cured and burley" (p. 2). This problem was given only brief treatment by Tennant, and Nicholls expressed general dissatisfaction with his more extensive investigation of leaf pricing.

Jackson's work, begun at Vanderbilt, represents an extension of Nicholls's investigation of the pricing of tobacco leaf. But it is also much more than this. Jackson has been able to go well beyond the limitations imposed by the record of the Tobacco Case through the introduction of significant new data supplied by the cigarette industry. And Jackson's interpretation of his data departs sharply from that of Nicholls and earlier students. Nicholls tended to hypothesize effective oligopsonistic control of leaf pricing as he examined each portion of the record. Jackson, on the other hand, concludes that "conspiracy has played no important role in leaf pricing" (p. 234, 235).

This conclusion—which applies to the level of leaf prices rather than to the seasonal stability of leaf prices—rests mainly on three arguments: (a) There is no record in the Tobacco Case of any significant formal conspiracy in leaf buying. (b) The complexities and inconsistencies of leaf grading have made it almost impossible to frame any kind of effective conspiracy in leaf buying. (c) Possible gains from the exercise of oligopsony power against the grower in the leaf markets have been quite small relative to the possibilities of gain from the exercise of oligopoly power against the consumer in the cigarette market. As a result members of

[1] The two other major studies are: Richard B. Tennant, *The American Cigarette Industry* (Yale University Press, 1950), and William H. Nicholls, *Price Policies in the Cigarette Industry* (The Vanderbilt University Press, 1951). Mention should also be made of the unpublished doctoral dissertation by W. C. Baum, *Workable Competition in the Tobacco Industry* (Harvard University, March, 1949).

the industry have devoted their efforts to equalization of leaf costs among firms rather than forcing the average leaf price to the level that oligopsony control might have permitted.

Jackson's evidence regarding lack of "old fashioned" formal conspiracy as well as lack of "tacit" price leadership or effective application of percentage buying is convincing. The overwhelming difficulty of applying such practices to a commodity characterized by simultaneous and nondiscrete variations with respect to a large number of quality factors—factors whose characteristics apparently cannot be verbalized even by experienced buyers—gives added strength to his argument. When we add to this the fact that the grading systems of the major buyers differ considerably among themselves; that the correspondence between company and federal grades is rather poor; and that leaf is purchased at some 600 auction warehouses in more than 100 towns during the buying season, Jackson's position becomes even more compelling.

Although he rules out conspiracy, Jackson does argue that the rapid movement from initial price dispersion to over-all seasonal stability on the leaf markets can be attributed to three practices and one operating rule adhered to by the major leaf buyers. The three practices are: (a) Concentration of initial purchases in a few markets. This permits elimination of much of the price uncertainty prior to the opening of the other markets. (b) Careful estimation of the size and nature of the crop. (c) Resolution of interfirm differences in expectation by a process of trial and error in the initial bidding.

The operating rule—*Do not permit a competitor to develop a cost advantage in leaf buying*—is of special significance. Adherence to this rule largely eliminates raw materials as a cost variable. The particular level at which raw material costs are equalized is less important than the fact that they are equalized. With equalized raw material costs and identical wholesale and retail selling prices the major area of competitive behavior is then centered around the problem of advertising and its impact on sales volume.

In addition to his main argument Jackson's presentation raises several interesting issues. He leaves a rather clear impression that the distinctions made by the federal grading system reflect rather incompletely the buying preferences of the leaf buyers (p. 199). He raises, but does not attempt to answer, the question of whether or not federal price and tax policy have done more to discourage competition behavior in the cigarette industry than the antitrust division has done to stimulate competition (pp. 80, 81, 85, 86). And the question of whether the benefits to the farmer from the tobacco program have been paid for out of reduced oligopoly

profits or through higher prices for cigarettes is posed and then left for future investigators to answer (pp. 94, 95).

In spite of its definitive treatment of the pricing of cigarette tobacco during the period 1911-46 I expect that this book will not be widely read. Practitioners in the field of tobacco marketing will find it somewhat weak in its handling of the period since 1946. And they are likely to feel that the presentation is too laborious. The book will also suffer from the fact that it is practically impossible to pick out any single chapter that will fit neatly into an assigned reading list of a course in prices, price policy or marketing. Both the subject matter and the treatment are such as to require a complete reading of the text.

VERNON W. RUTTAN

Purdue University

Consumer Economics, James N. Morgan, New York, Prentice-Hall, Inc., 1955. Pp. viii, 440. $8.00.

This book has the advantage of being in a field where there is a dearth of scientific material that will stand tests for statistical significance. Much of it will not even lend itself to probability tests because it is based on individual values. It has the disadvantage of dealing with a very prosaic general subject in which the reader will likely tell you he either knew it before or disagrees.

The reader who expects to find a book organized around neatly arranged principles is due to be disappointed—as is also the reader who picks it for a "buying guide." It is somewhere between these two types, using mainly the empirical method of demonstration. The book is generally addressed to the consumer audience.

The book is organized into twelve chapters, some of which are given separate introductions. Footnotes, except those pertaining to charts and tables, are at the end of chapters. There are very few charts and the tables are simple. The author will not have "knocked out" his audience with large masses of data. At the end of most of the chapters are "Suggested Projects," some of which could involve considerable research whereas others are very simple and could well be afternoon bridge club topics.

The author evidently has made careful preparation in most of the major fields reported in the book. This seems especially true for the chapters on insurance, medical care, and housing. Food is treated as an item among "Other Major Consumer Expenditures."

There are several apparent inconsistencies and other statements that need modification or clarification throughout the book. Perhaps these

will not be important to many of the readers. Although not necessarily so, it may seem inconsistent to indicate that the consumer gets a low interest rate on money he lends and still pays a high interest rate when he borrows. It seems that the author does not always make a clear-cut distinction between investments and expenses. His reading audience may encounter some mental difficulty when finding both monetary and nonmonetary items added together in a personal balance sheet.

The author—I believe with justification—calls attention to the fact that many of the new "wonder products" are not so wonderful. On page 126 he states that "In recent years it has seemed almost a rule that anything new, however widely hailed, had certain drawbacks at least in its initial stages." This is probably a cue to one of the firmest recommendations he makes to consumers—that is, they should not shift from one brand or product to another too easily.

On page 136 is stated—"One consequence of free consumer choice has been a natural tendency to prefer variety and special services, and an equally natural tendency of sellers to provide these." My own recent research experience has been that some of the large food chains consider their stores overitemized and carry on a planned resistance against further product differentiation. They feel a squeeze on the economy of scale with too much diversification in products and services.

A fair amount of space is devoted to farm price supports in the chapter called "The Consumer as a Voter and Citizen." Many adverse effects upon the consumer's position are pointed out. On page 365 is stated that "In the main the support prices, loans, and purchase agreements can be looked at as methods of preventing excessive price fluctuations (particularly downward) and the output restrictions combined with higher support prices as a method of subsidizing farm incomes." It is not pointed out that the food *supply* may be stabilized by price supports. The argument advanced for minimum-wage laws seems to take a different turn in the statement on page 385 that our country has such laws "not only to avoid exploitation, but on the ground that an industry that hired them so cheaply would be really subsidized by the rest of society." The argument advanced is that with wages too low the workers would fall back on public relief.

The author deals with the problem of choosing an occupation, which may seem like production economics but this need be of no great concern. He does show that he lacks faith in vocational aptitude tests. On page 415 he says about these that "They clearly should not be taken too seriously. I have taken some of them and they indicate that I should be a farmer." The author furnishes no evidence to the effect that he

should not be a farmer. He also takes a dim view of books of the "do-it-yourself" type, maintaining that it is best to talk with someone who has done the job in question.

The book is of a nature that it does not lead to any major conclusions. If there is a conclusion to be drawn by the reader it is probably that most of the time it will not pay to shop around a great deal for bargains because our competitive economy has already done this for the consumer.

The first statement in the preface is "You, as an American consumer, are an extremely important person." Although Morgan admits that producers organize more easily into influential units in an economy such as in the United States, he addresses the consumer. The book as a whole might be useful as a text at the high school level. At the college level it might be a useful reference in some courses. The extensive bibliographies in the footnotes at the end of the chapters could be of value to teachers and researchers.

NORMAN NYBROTEN

West Virginia University

NEWS NOTES

Grant E. Blanch, farm management teacher and research worker at Oregon State College, left November 27 for two years in Thailand. He will join the OSC group on contract with Kasetsart University. His duties are to develop a program of research in farm management and assist with teacher training. Funds for this assignment were provided by the Council on Economic and Cultural Affairs.

J. A. Boan is on leave of absence from the Canada Department of Agriculture in order to teach full time at the University of Alberta, where he is replacing William Mackenzie who is engaged in research by the Royal Commission on Canada's economic future.

James O. Bray has returned to Kansas State College after spending a year at Oxford University. Professor Bray was on leave during the 1954-55 academic year during which time he engaged in post-doctoral study at Oxford and traveled on the Continent in the summer months.

Durward J. Brewer has resigned at Oklahoma A. and M. College to accept an instructorship at the University of Missouri. He will also work toward his doctorate at the University.

George W. Campbell, Jr., has joined the staff of the University of Arizona as Associate Agricultural Economist. Dr. Campbell received degrees from the University of California, Davis and his Ph.D. degree from Purdue. He came to his present job from Western Condensing Company, Petaluma, California.

John R. Christiansen joined the staff of the Farm Population and Rural Life Branch, Agricultural Economics Division, AMS, in October 1955. He is a social science analyst and has been collaborating with the Department for some time. He is now carrying out studies relating to farm population in cooperation with the University of Kentucky and will be stationed at Lexington, Kentucky.

John B. Claar joined the Federal Extension Service staff as Chief, Farm Management and Production Economics Branch, Division of Agricultural Economics Programs, on September 26, 1955. Jack Claar came from the University of Illinois where he had been engaged in farm management extension and field work.

Lee M. Day reported at St. Paul, Minnesota, on November 4 as Agricultural Economist with the Production Economics Research Branch, ARS. Until joining the Branch, he was a member of the agricultural economics staff at the University of Wisconsin. He will work on the cooperative study of adjustments in dairy farming in Minnesota.

Milton E. Decherd, Jr., a statistics major and 1955 graduate from the University of Texas, has been employed by the Cotton and Oilseeds Branch of Farmer Cooperative Service, U. S. Department of Agriculture. He will work on cottonseed and cotton gin studies.

Joseph M. Doris, formerly a member of the staff of the University of Maryland, Agricultural Extension Service and the federal-state dairy and poultry market news as a reporter at Baltimore, Maryland has transferred to the position of federal-state dairy and poultry market news reporter at Jacksonville, Florida. Paul Brown, formerly of the staff of the University of Maryland, replaces Mr. Doris in Baltimore.

E. C. Elting, who has acted as Agricultural Research Service Assistant Ad-

ministrator for Experiment Stations since retirement of the late R. W. Trullinger, has been appointed successor to Dr. Trullinger and the rank of the office has been elevated to Deputy Admininstrator of the Agricultural Research Service. ARS now has three deputy administrators. Dr. George W. Irving, Jr., is in charge of research activities. Dr. M. R. Clarkson heads the crop and livestock regulatory work.

R. M. Finley has been appointed Extension Farm Management Specialist at the University of Illinois.

Gertrude C. Foelsch, who is the author of many articles and bulletins on dairy marketing, retired from Market Organization and Cost Branch, Marketing Research Division, AMS, on September 30, 1955. She is now living in Lakeland, Florida.

Conrad Gislason has joined the staff of the State College of Washington.

George H. Goldsborough,, who was formerly with the Transportation and Facilities Branch, Liaison Office, has joined the staff of the Market Development Branch, Marketing Research Division, AMS, to become Head of the Merchandising Methods Section.

Harold G. Halcrow has been elected to the Board of Directors of the National Bureau of Economic Research Inc. as the representative of the American Farm Economic Association. This position was formerly held by Frederick W. Waugh, who resigned due to pressure of outside activities.

Richard Hall has moved to New Orleans, Louisiana, from Washington, D.C., and will be engaged in marketing research studies conducted by the Market Development Branch, Marketing Research Division, AMS in cooperation with the Southern Utilization Research Branch, ARS.

R. A. Hinton joined the staff of the University of Illinois on October 1 as Research Associate. He is presently completing the thesis requirement for the Ph.D. at the University of Minnesota.

Ruth Hodgson joined the staff of the Division of Agricultural Economics Programs of the Federal Extension Service on October 1 to assist in consumer work. Miss Hodgson was formerly with the New York Agricultural Extension Service.

D. J. Hunter joined the staff at the University of Illinois on November 1 as Research Associate. He is completing the thesis requirement for the Ph.D. at Iowa State College.

John J. Lancaster became Assistant Extension Economist at the University of Georgia, October 1, 1955. He was formerly special County Agent in Charge of Farm Planning in the TVA area of Georgia.

Charles W. LeGrande, Analytical Statistician (Agriculture), Office of the State Statistician at Springfield, Illinois, has transferred to the Dairy Statistics Branch of the Agricultural Estimates Division at Washington, D.C., on September 29, 1955.

James G. Maddox has been associated for the past two years with the University of Chicago working on a study evaluating United States technical assistance activities in Latin America. He is now on appointment with the American Universities Field Staff as a faculty member at a number of American universities. His field of concentration is Latin America and he is on assignment in Mexico for the coming year.

Raymond Marshall, Assistant Professor of Agricultural Economics at Oklahoma A. and M. College, has resigned his position to enter private business in Oklahoma.

Robert G. Martin, formerly on the staff of Pennsylvania State University, has been appointed to a position of Agricultural Economist in the Market Organization and Cost Branch, Marketing Research Division, AMS.

J. K. McDermott joined the Purdue University staff as Assistant Professor on November 1. He was formerly on the extension staffs at the University of Missouri and at the University of Illinois. Professor McDermott will do extension and research work in land economics, local government and rural development.

William Meyers, Agricultural Extension Service, University of Nebraska, has been appointed local Federal-State Dairy and Poultry Market News representative at Lincoln, Nebraska.

Jarvis E. Miller joined the staff of the Texas Agricultural Experiment Station as Assistant Professor, September 1955, to work in livestock marketing. He was granted a Ph.D. degree by Purdue University in January 1954 and served with the U. S. Air Force until August 1955.

Marshall E. Miller, who has been in New Orleans, Louisiana, since July, is returning to the Washington office of the Market Development Branch, Marketing Research Division, AMS, to become head of the Product Development Section in that Branch.

Troy Mullins, Production Economics Research Branch, ARS, is stationed at Fayetteville, Arkansas, as of November 1, after serving at Baton Rouge, La., since September 1950.

Niels I. Nielsen, in charge of the state statistician's office at Portland, Oregon transferred, around the week of November 21, 1955, to the state statistician's office at Sacramento, California, and will assist George A. Scott, in charge of the Sacramento office.

Lewis G. Norwood became a member of the staff of Agricultural Economics Programs, Federal Extension Service, effective December 1, as leader in food merchandising extension programs. For the past several years he has been associated with the New England states regional program of marketing education for food retailers.

P. E. Nystrom, formerly Head of the Department of Agricultural Economics and Marketing and Director of Instruction, was appointed Director of the Extension Service of the University of Maryland October 1, 1955.

Patrick E. O'Donnell, head of the Fluid Milk and Cream Section, Dairy Statistics Branch of Agricultural Estimates Division, AMS, transferred on December 5, 1955 to the Foreign Competition Branch (dairy products) of Foreign Agricultural Service, U.S.D.A. He will be primarily concerned with foreign competition in dairy products and with programs and plans for moving U. S. butter, cheese and nonfat dry milk into international trade. Mr. O'Donnell has been with the Agricultural Estimates Division since 1946.

Russell Olson, Production Economics Research Branch, ARS, stationed at Ohio, is on leave for a year to take an assignment in India. Ohio State University is one of four land grant colleges that have contracts with the International Cooperation Administration and the Indian Government to work with the provinces of India in developing agricultural research, extension, and college teaching programs. A team of nine men is being sent to the area for a two-year period. The team consists of Dean T. S. Sutton, who will head the mission and advise on animal nutrition; Dr. E. Dakan, poultry scientist; Dr. Blackmann, dairy scientist; J. P. Schmidt, rural sociologist; Guy Dowdy, extension training specialist; James Beatty, horticulturist, Russell Olson as agricultural economist;

an agronomist; and a highway construction engineer. Most of the group will be stationed at Ludhiana, in Punjab Province, where a small college will be expanded. Russell Olson will be stationed at Patiala in Pepsu Province where a new agricultural college is being formed.

Raymond M. Pallesen, Analytical Statistician (Agriculture) State Statistician's Office at Des Moines, Iowa, transferred on September 14, 1955, to the Crop Reporting Board, Agricultural Estimates Division at Washington, D.C. He now is Assistant Secretary to the Crop Reporting Board.

Victor B. Phillips joined the staff of the Market Organization and Costs Branch, Marketing Research Division, AMS, in October 1955.

Sydney C. Reagan has resigned as Chairman of the Real Estate Department, Commodity Stabilization Service, U.S.D.A. in Washington, D.C., to accept a position as Professor with Southern Methodist University.

Waldo S. Rowan resigned September 15, 1955, as Associate Professor of Agricultural Economics at the University of Georgia. Dr. Rowan was in charge of grain marketing research. He has accepted a position with Foreign Agricultural Service and is stationed at Ankara, Turkey.

Lorand D. Schweng has accepted a technical assistance assignment under the auspices of the International Labor Office and is now working as the Director of the Pillapi Project of the Andian Mission on Lake Titicaca in Bolivia.

A. D. Seale, Jr. of the Department of Agricultural Economics at North Carolina State College accepted a position as Assistant Professor of Agricultural Economics at Mississippi State College, effective January 1, 1956.

Will M. Simmons, Analytical Statistician (agriculture) was appointed September 9, 1955 to a position in the Statistical and Historical Research Branch of the Agricultural Economics Division, AMS. He will be working with fruits and vegetables.

Sol Sinclair, Chairman of the Department of Agricultural Economics and Farm Management, of the University of Manitoba, has been appointed Chairman of the Board of Review under the Prairie Farm Assistance Act of the Canada Department of Agriculture.

Sigurd Stangeland joined the staff at North Dakota Agricultural College in February, 1955. Mr. Stangeland was formerly at South Dakota Agricultural College and had his own farm management service prior to his joining the staff at North Dakota.

Ira M. Stevens, graduate of the University of Wyoming, with extensive ranching and livestock marketing experience, has been employed by the Livestock and Wool Branch of the Farmer Cooperative Service. U. S. Department of Agriculture. He will work on cost and efficiency studies of livestock marketing associations.

James H. Street has been promoted to Associate Professor of Economics at Rutgers University. He has recently returned from Paraguay, where he was visiting professor in the National University of Asuncion. At the conclusion of his stay he was awarded an honorary degree of Doctor of Economic Sciences by the university and presented with a gold medal by the faculty.

Dennis E. Stringer, formerly a member of the staff of the Mississippi State College, Agricultural Extension Service, has accepted an appointment with the Dairy Division, AMS. He is in charge of the Federal-State Dairy and Poultry Market News office at Jackson, Mississippi.

Lester Telser of the University of Chicago has joined the faculty of Iowa

State College as Assistant Professor of Economics, beginning January 1, 1956.

George Tolley, of the faculty of the University of Chicago, has been appointed Associate Professor of Agricultural Economics at North Carolina State College, Raleigh, effective January 1, 1956.

James Vermeer will head the new Farm Cost Analyses Unit in the Production, Income and Cost Section, Production Economics Research Branch, ARS. Principal duties of the new unit will be to conduct research in the field of farm costs, enterprise and commodity costs, and farmers' response to changes in costs, technology and cost rates, and cost-price relationships.

Cecil H. Wadleigh, career scientist and administrator in the U. S. Department of Agriculture, has been named Chief, Soil and Water Conservation Research Branch. Dr. Wadleigh fills a position that has been vacant since the death of Dr. Robert Salter on September 13, 1955. Prior to this appointment, Dr. Wadleigh served in the Soil and Water Conservation Research Branch as head of the Section of Soil and Plant Relations.

Harold R. Walker, retired from government service on October 31, 1955. He was head of the Food Grain and Legume Crops Section, Field Crop Statistics Branch of Agricultural Estimates Division, AMS, in Washington, D.C. He had twenty and one-half years of service and in 1954 received a U.S.D.A. Superior Service Award for his significant contribution of effective interpretation and use of the monthly crop reports, through the marked genius he displayed in composing the general commentary. He plans to pursue his woodworking hobby at Hill City, Minnesota.

Harold G. Walkup joined the staff of the Division of Agricultural Relations, Tennessee Valley Authority, September 26 as Agricultural Economist. Mr. Walkup was formerly at the State College of Washington.

Paul Wallrabenstein, Special Statistical Branch, Agricultural Estimates Division, AMS, has been selected to be in charge of the Federal-Territorial cooperative field office at Honolulu, Hawaii. This is the forty-second office of the Agricultural Estimating Service, and probably will be opened sometime during the latter half of December, or as soon as Mr. Wallrabenstein arrives. This field office is to be set up in cooperation with the Extension Service at the University of Hawaii. Mr. Wallrabenstein came to Washington from the West Virginia Office of the State Statistician in 1945. He had been in the Columbus, Ohio, office for 11 years as a state collaborator until he entered the Federal Service in 1942. From 1945 to the present Mr. Wallrabenstein has headed the Farm Employment and Wage Estimates Work of the Special Statistical Branch of Agricultural Estimates Division, AMS.

S. T. Warrington, livestock marketing economist, Federal Extension Service, transferred on October 21 to the Foreign Agriculture Service of the United States Department of Agriculture.

Carlton E. Wright, of the agricultural economics staff at Ithaca, New York, spent August, September and October with the Federal Extension Service, Division of Agricultural Economics Programs assisting in the development of programs of market information for consumers.

Arrangements have been made by the Production Economics Research Branch, ARS, and the California Agricultural Experiment Station to assemble a number of items of pertinent data needed for the nation-wide study on the effect of acreage allotments on farm income. Dr. J. E. Faris, a new member of the Giannini Foundation staff, has been engaged as a consultant to the Produc-

tion Economics Research Branch, ARS, to assemble data on rice farms in California for purposes of this study.

Norman T. Zellner of California has joined the Staff of the University of Tennessee as an Assistant Professor and Assistant Agricultural Economist.

Cooperative Graduate Summer Sessions in Statistics.

The University of Florida, North Carolina State College, Virginia Polytechnic Institute and the Southern Regional Education Board are jointly sponsoring a series of cooperative summer sessions in statistics.

The third of these summer sessions will be held at North Carolina State College, June 11-July 20, 1956. A session is scheduled to be held at Virginia Polytechnic Institute in 1957 and at the University of Florida in 1958. Each semester session lasts six weeks and each course carries approximately three semester hours of graduate credit.

The 1956 session will be held jointly with the Institute in Quantitative Research Methods in Agricultural Economics, sponsored by the Social Science Research Council. Several statistics courses will be oriented towards economic applications.

Inquiries should be addressed to:

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